Products Finishing

CLEANING
PLATING
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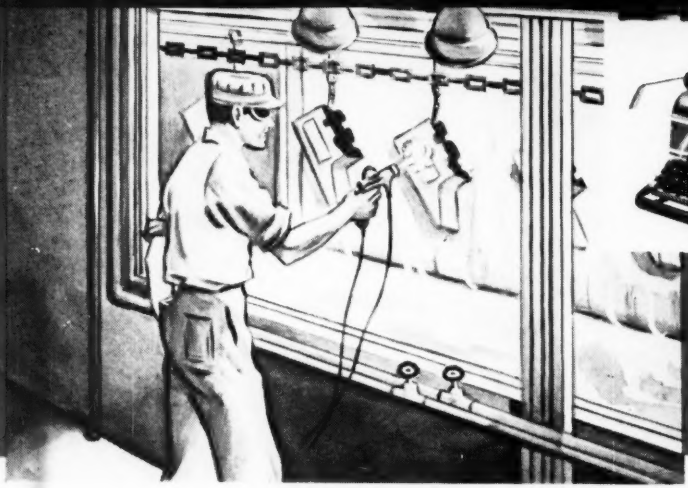
FINISHING

NOVEMBER 1949



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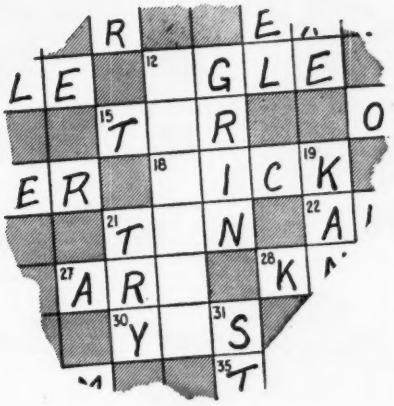

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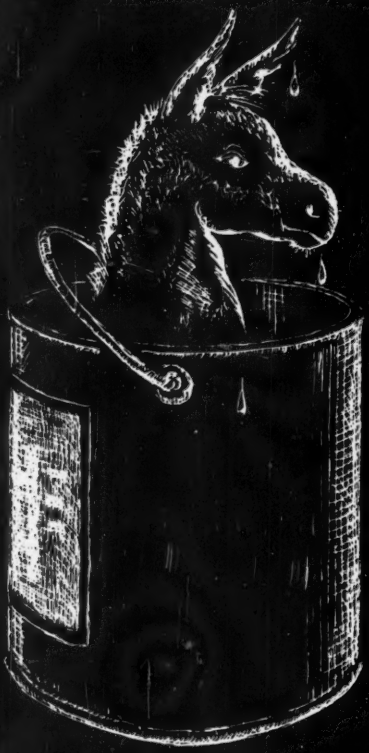

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Products finishing

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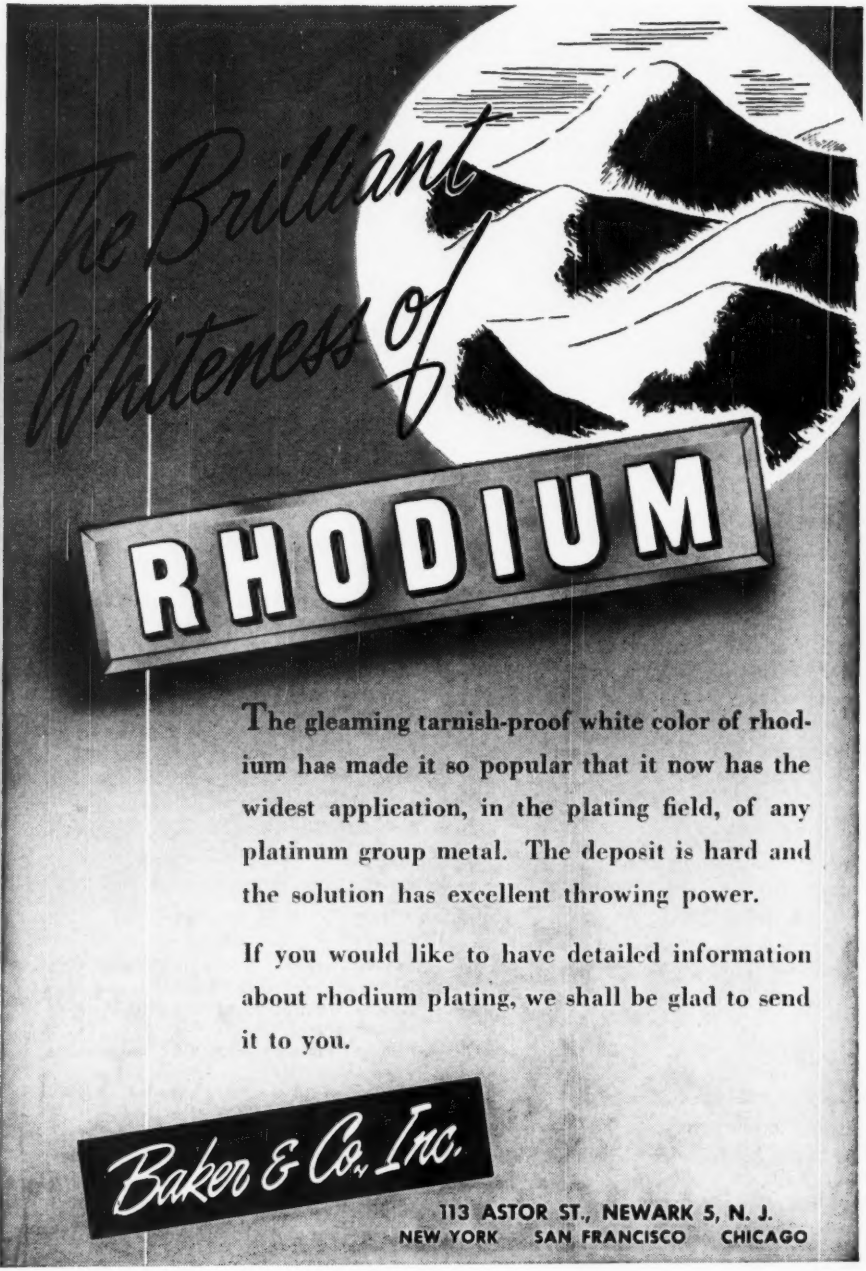
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Pf editorial

Vol. 14, No. 2

NOVEMBER, 1949

Identify Quality Plating

An organization merchandising great quantities of plated products, or products on which plated parts are used, has established, through its testing laboratory, a system of grade labeling so that the customer may select plated products with confidence and with the knowledge that the finish will retain its beauty for the normal life of the product. If a system of labeling could be worked out for application to plated products generally, the plating industry would benefit from a wider consumer acceptance of plating as a quality finish.

Currently, although highly satisfactory, systematic recommendations have been made and specifications established, there is no widely adopted system of identifying the plated product which conforms to the specifications and possesses correspondingly superior properties of resistance to surface discoloration, wear, or corrosion.

One example of product labeling as a means of identifying quality finishes may be cited in the case of the Porcelain Enamel Institute whose member companies affix the distinctive seal of the Institute to their porcelain enamel products to show that the finish has been applied according to certain standards and will withstand certain tests, such as acid resistance, abrasion resistance, and so on. Similarly, the Steel Kitchen Cabinet Institute supplies members with the Institute seal to attach to cabinets finished in synthetic enamel to indicate that products so identified will withstand the rigid tests conducted by the Institute (see "Proving Ground for Quality" in July 1949 issue of PRODUCTS FINISHING).

In the plating field the ASTM has established standards of thickness for various metals plated for various purposes, and trade associations in the field generally encourage their members to abide by these standards. However, there are no means generally used to identify the plate of high quality. In some cases it may be difficult to accomplish this purpose since the plated parts form only a portion of the completely assembled product. Nevertheless, it is submitted that this is a subject for serious study and consideration to the end that a plated product of superior quality may be recognized as such by the consumer, with the result that the confidence of the consumer in electroplated finishes may be more firmly established.

E. A. Blount

Pop Corn Vendor has a variety of Exterior Finishes

Pop corn vendor bodies are manufactured by forming and resistance welding, and finished by spray painting and infra-red baking. Stainless steel reinforcing rings and coin insert plates are electropolished to mirror brightness.

By EZRA A. BLOUNT

PF FEATURE

In the plant of the Texas Engineering and Manufacturing Company, Inc., 3000 employees are engaged in a variety of occupations. Temco's activities include overhaul and reconditioning of airplanes for the United States Air Force, foreign governments, and commercial interests; conversion of transport planes for domestic and foreign airlines; subcontract work for other aircraft manufacturers; manufacture of the Swift 125 all-metal airplane; and manufacture of a wide variety of commercial sheet metal products. One such item, the pop corn vendor, illustrated in Fig. 1, is representative of this group of manufactured products.

Temco was organized late in 1945 as a partnership by two North American Aviation executives, Robert McCulloch and H. L. Howard, after the end of the World War II closed NAA's Dallas, Texas operation. It was converted to a stock corporation early in 1946 with McCulloch becoming president and general manager, and Howard executive vice president and treasurer.

Temco occupies all of Plant A of the original North American Aviation war-built facility at Grand Prairie on the western limits of Dallas under a lease agreement with the U. S. Navy. The building has 1,229,500 square feet of floor space. Smaller buildings also are on the site and there are an additional 500,000 square feet of paved working space adjoining the main building under lease to Temco. Buildings are air-conditioned and windowless and are among the most modern industrial facilities in the United States. The article heading presents an exterior view of the entrance side of the Temco plant.

Cleaning and Finishing Operations

Sheet metal products, such as the pop corn vendor, are produced in the General Products Department of Temco under the direction of J. V. McIntosh and R. L. Harris. The usual sheet metal blanking, forming, and resistance welding operations are closely coordinated to produce vendor cabinets and accessories rapidly and efficiently. Lines of welders are located near the cleaning tanks and conveyors so that cabinets may progress through the assembly welding unit and com-

Fig. 1—A group of completed pop corn vendors assembled as a display to illustrate one of Temco's many and varied manufacturing operations

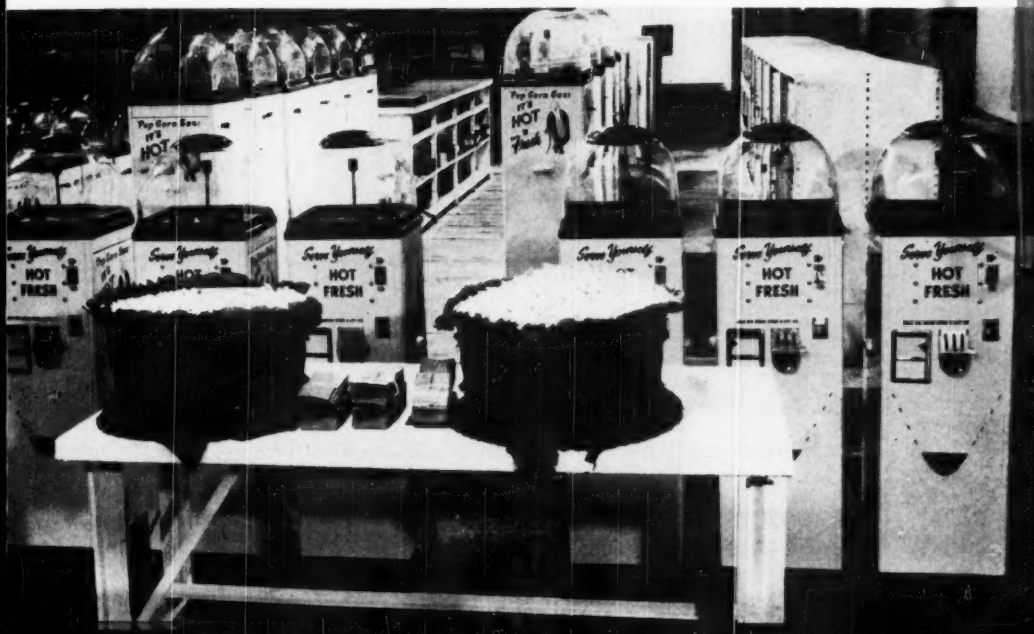

Fig. 2—Vendor bodies are cleaned in a tank of boiling alkaline cleaner, after which they are phosphatized for corrosion resistance and to promote paint adhesion.

plete the last operation at a point adjacent to the cleaning tanks. Handling of the product in all stages of the operation is done mechanically.

Vendor bodies are placed in carriers or specially designed racks for cleaning and phosphate coating. Figure 2 shows a rack of cases being lowered into the alkali cleaner tank. Parts remain in the cleaner for 8 to 10 minutes and are freed from oil, grease, and dirt in a solution of Kelite 41 operated at a temperature of 180-200 deg. F. The cleaning operation is followed by a rinse in warm water, which is in turn followed by a brief immersion in Oakite 935 phosphate coating solution operated at 180 deg. Fahrenheit.

Cabinets are removed from the phosphate treating solution and placed in a special jig or carrier attached to an overhead monorail conveyor. On this carrier the bodies and other accessory parts are transported completely through the paint spraying and baking operations and returned to the loading

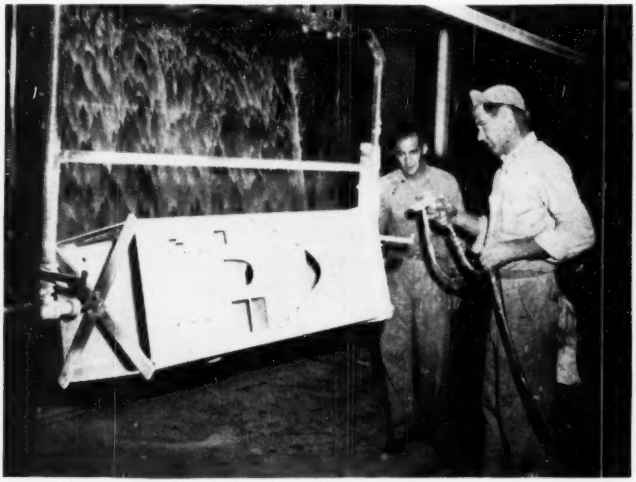

Fig. 3—A view of the water - wash spray booth in which primer is applied to vendor cabinets as they are carried through the operation on an overhead monorail conveyor. As can be seen in this illustration, the carrying fixture is so constructed that the body may be rotated through four spraying positions so that all sides may be sprayed properly.

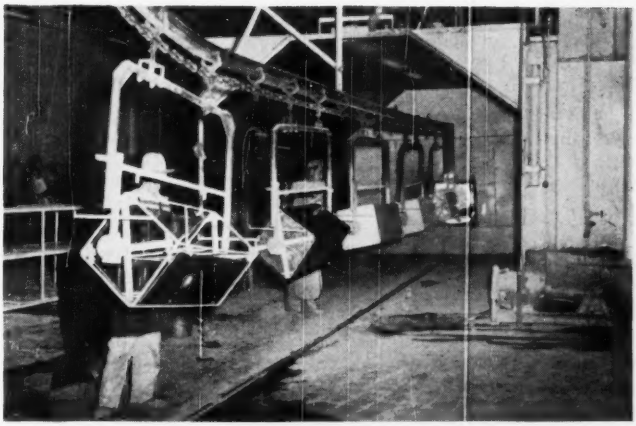

Fig. 5 — A view of a water - wash spray booth at the opposite end of which may be seen the entrance to the infra-red baking oven

point, which is also an unloading point for parts which are ready for final assembly.

The paint department is separated from the rest of the shop by a concrete block wall as an aid to shop cleanliness and to reduce fire hazards. In the paint shop the vendor bodies proceed through a 15-foot water-wash spray booth, as may be seen in Fig. 3, in which the prime coat is applied. A 10-foot high water curtain in the rear of the spray booth carries away overspray paint and assists in clarifying the air in the paint shop. The Titanine yellow primer is applied from a 30-gallon pressure tank.

The conveyor then carries the parts through an 80-foot setting-up area, after which the parts enter a second water-wash spray booth in which a fog or mist coat and a finish coat of Jones Blair color enamel are applied. Figure 4 is a view of the paint shop showing the setting-up area and at the left, the second water-wash spray

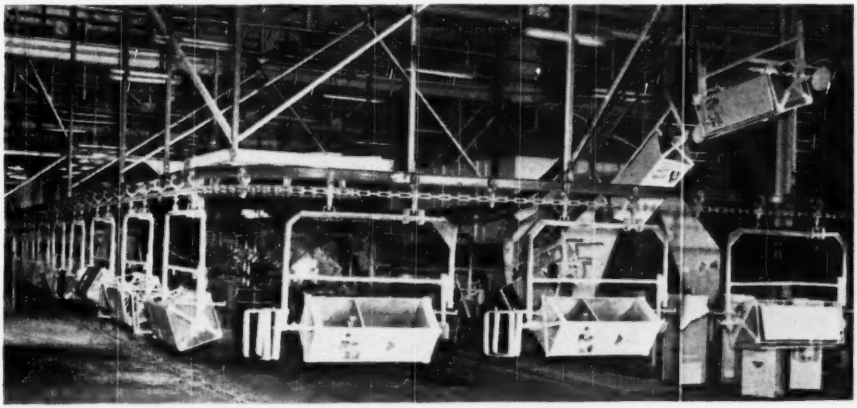

Fig. 4—A general view of the paint shop, showing the compact, efficient arrangement of spray booths and other equipment

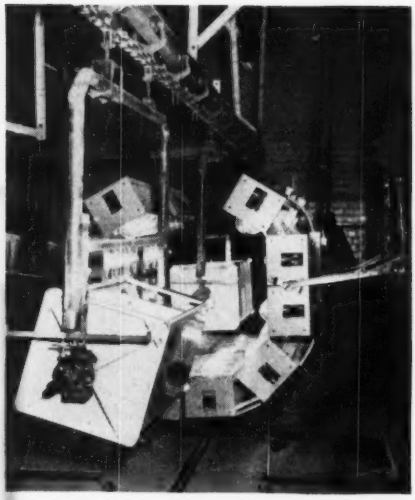

Fig. 6—A close-up view of a typical infra-red lamp assembly which is used to bake the finish on the pop corn vendors

booth. Figure 5 is a close-up view of the finish coat spray booth in which the bodies are prepared for the baking operation.

Baking is accomplished in an infra-red oven constructed from portable infra-red units assembled in a manner similar to that shown in Fig. 6 and enclosed in a sheet aluminum tunnel which is vented so that heat and fume control can be effected. The infra-red tunnel is 25 feet long and contains 300 250-watt infra-red lamps.

As the parts emerge from the oven, attractive decals are applied, masking tape and paper shield the body, and the bases are sprayed with air-dry black enamel. Figure 7 shows the completed pop corn vendor bodies being carried overhead en route to the assembly track where assembly operations are completed.

Electropolishing

Dome reinforcement rings, coin register arms, and coin insert plates are fabricated from stainless steel. After drawing compounds are removed in a vapor degreaser, these parts are electropolished in a solution composed of three parts phosphoric acid and one part sulfuric acid operated at a temperature of 150-170 deg. F. A lead-lined tank 4 x 8 x 3 feet deep is used

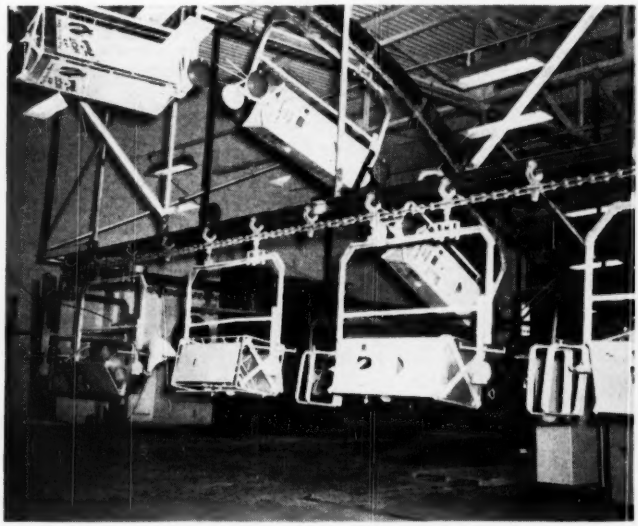

Fig. 7—Pop corn vendor bodies and dome covers, each finished in the proper combination of colors, proceed from the paint shop to the final assembly line.

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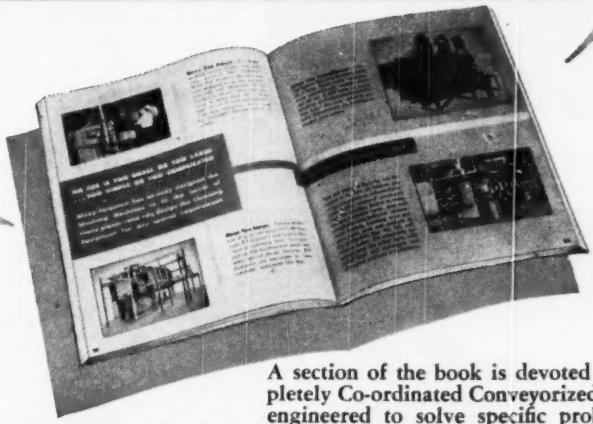

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Fig. 8—Dome reinforcement rings, having been degreased, are racked for electropolishing.

for this operation. Lead-antimony alloy cathodes serve to complete the electrical circuit. For this electropolishing operation solid copper racks, upon which reinforcement rings are placed for treatment (see Fig. 8), are used. The racks require no insulation. The electropolishing solution does not erode the racks seriously, nor does the solution become contaminated with copper compounds. A treatment time varying from 12 to 30 minutes is used to electropolish the parts. The reason for the variation is that the solution works much faster when it is new and requires a longer treatment time after it has been in use for a period of time. It is simpler in this case to permit the solution to operate until it has to be discarded rather than to attempt to maintain standard conditions of concentration at all times. The voltage used for electropolishing is 5 volts and the current density varies from 10 to 15 amp-

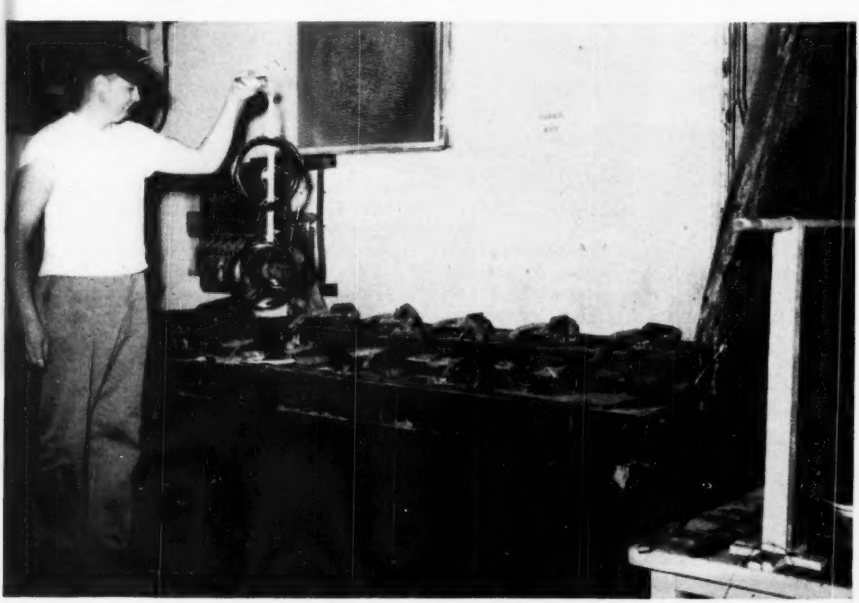

Fig. 9—A view of the electropolishing tank, showing a rack of electropolished reinforcement rings being removed from the tank for rinsing and unracking

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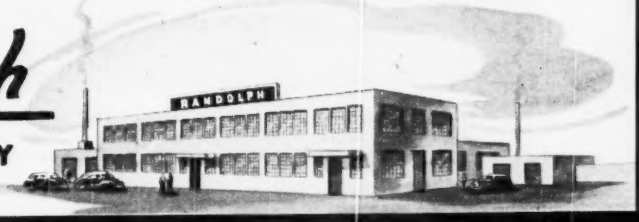

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eres per square foot. The lead-lined electropolishing tank, a view of which may be seen in Fig. 9, is encased with a water jacket in which coils are placed to control the temperature.

Leaving the electropolishing tank, stainless steel parts are given a cold water rinse followed by a hot water rinse, after which the parts are unracked and transported to the final assembly line. As the electropolishing solution decreases in activity, it is sometimes necessary to use a ½ per cent nitric acid dip as an intermediate treatment between the cold and hot water rinses.

Some of the interior parts, such as operating cams, are cadmium plated for corrosion resistance in that portion of the Temco plating room devoted to general purpose plating, a view of which is shown in Fig. 10. After the cadmium plating operation, which is conducted in the normal manner, parts are given a cold water rinse followed by a bright dip in a solution of 20 oz./gal. of chromic acid. A cold water rinse and hot water rinse follow to complete the treatment. Light condulet tubes and miscellaneous steel parts used for trim are chromium plated in the usual fashion in a 33 oz./gal. chromium plating solution with a 100-to-1 sulfate ratio.

Assembly

All parts required for the assembly of the pop corn vendor, having received the proper surface treatment, are transported to the 30-foot endless-belt-type slat assembly conveyor for final assembly, inspection, and packaging. Since the major part of the assembly is the body or cabinet, the assembly track is located at the loading and unloading station of the overhead conveyor which transports the bodies through painting and baking operations. In Fig. 11, a view of the assembly

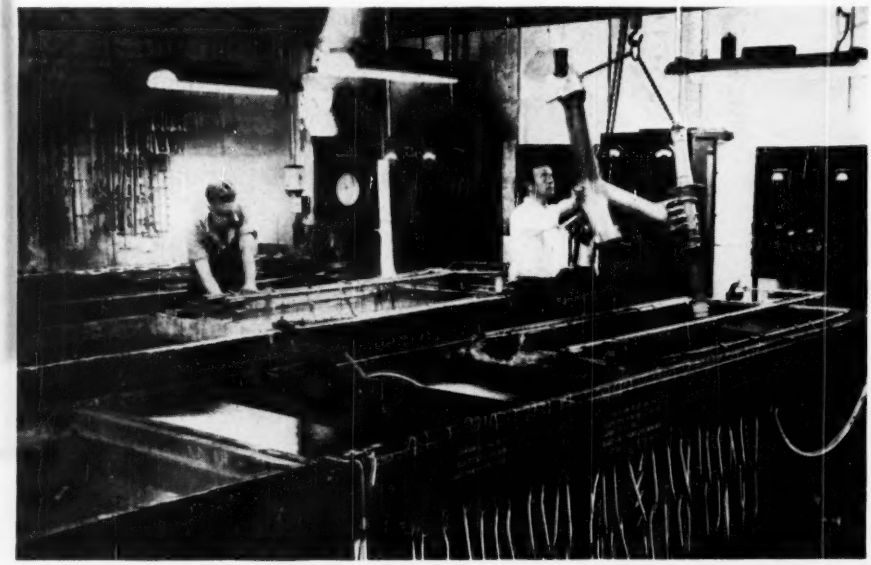

Fig. 10—A view of the section of the plating room devoted to general purpose plating. Further illustrating the diversity of operations throughout the entire plant, in this view may be seen an aircraft landing gear being lowered into a tank for cadmium plating.

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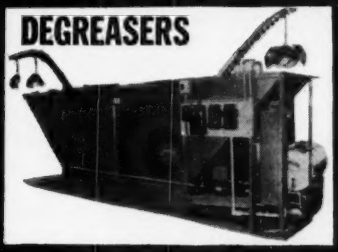

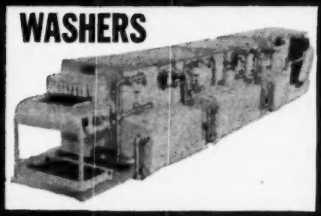

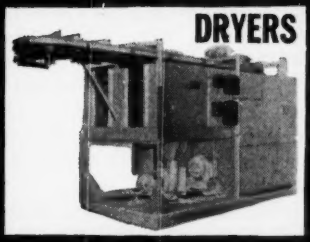

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Fig. 11—Completed pop corn vendors are inspected and packed carefully for shipment to various parts of the United States.

line, inspectors and packers apply finishing touches to the pop corn vendors and prepare them for shipment.

Other sheet metal products varying from truck bodies to farm tractors are manufactured at Temco in similar finishing setups. Drink dispensers, chipped ice dispensers, and similar products are processed through the same manufacturing and finishing cycle as that described for the pop corn vendors. It is interesting to note that in an organization whose major interest centers around aircraft, a department has been established for the manufacture of sheet metal products of various kinds to furnish the necessary business diversification, and to serve as a cushion during periods when the aircraft industry may not require the employment of the company's entire facilities.

Flame Spraying of Polythene

A SUCCESSFUL method for the flame spraying of polythene on metal surfaces has been developed by the Engineering Research Laboratory of the Du Pont Company. It is considered a practical system which should find application in industry.

Polythene is unusually inert and thus is highly resistant to corrosion. Because of this characteristic, the material is particularly attractive as coatings for metal surfaces, such as tanks and drums, where corrosion is a factor. However, polythene has been diffcult to apply by conventional methods because of its relative insolubility.

The problem in working out a satisfactory method of application was to melt the polythene particles and hold them at as high a temperature as possible without overheating them. Early work resulted in markedly degraded coatings and poor adhesion.

The satisfactory method now developed was accomplished by devising a spray gun in which the flame is obtained by mixing the fuel gas and the air needed for combustion beyond the torch nozzle, rather than by premixing them. Flames 8 to 12 inches long are used; and the gun is held so that the surface to be covered, pre-heated to 400 to 500 deg. F., is about 2 inches from the tip of the flame. By this method, approximately 16 square feet per hour can be covered.

Tests indicate that adhesion is good and that the temperatures used do not degrade the polythene. Exposure tests of 300 days' duration with sulfuric, hydrochloric, and other acids have shown no deterioration in coating properties or base metal attack.

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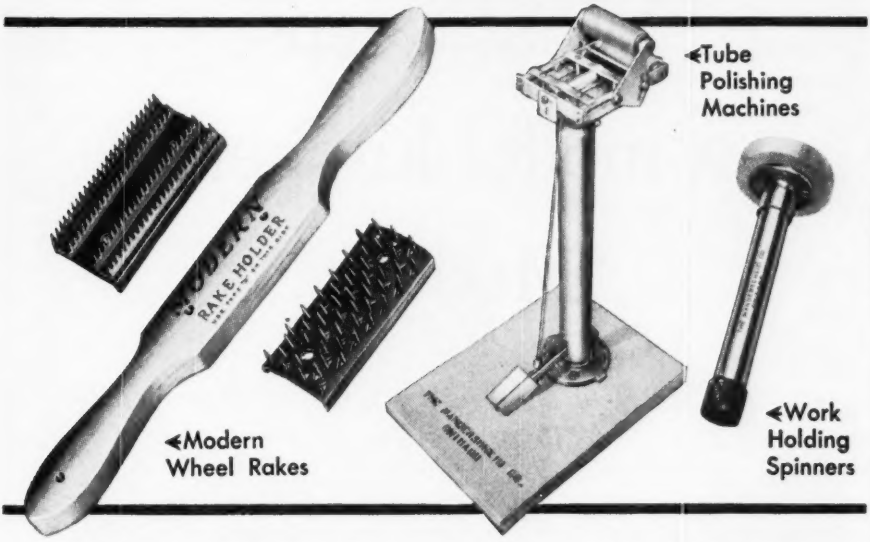

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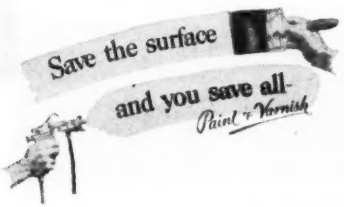

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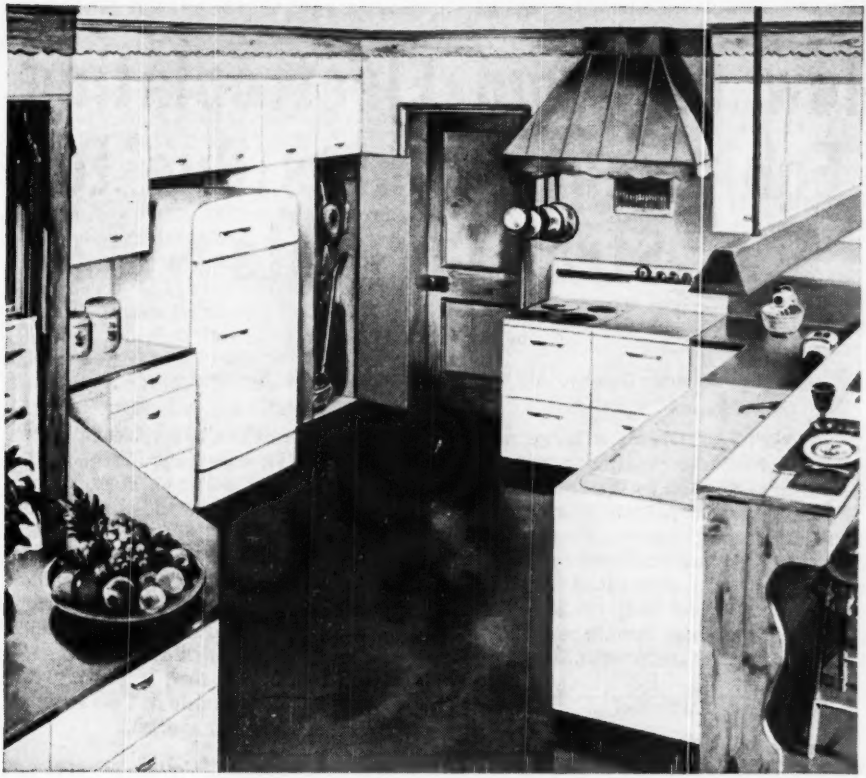

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How to Avoid Electroplating Equipment Failures Due to Stray Currents

By E. C. REICHARD
Research Metallurgist
American Smelting and Refining Company, Barber, New Jersey

INVESTIGATION of a large number of electroplating equipment failures has led to the formulation of several conclusions regarding installation and maintenance of such apparatus. To be considered in this discussion of failures caused by stray currents are switches, tank foundations, heating coils, ventilators, bolted joints, insulator maintenance, and bipolar action.

Switches

Use double pole switches to disconnect all tank bars from main bus bars when the tank is not in use.

Many installations use only a single pole switch, disconnecting only the work bar from the negative bus. While this stops the plating operation, it does not protect the tank and other equipment from stray current action. The first line of defense against stray current action is the complete isolation of the plating tank from the main bus bars when it is not in use. This requires disconnecting **both** the anode and the cathode bars from the main bus bar system. This is readily done by installing double pole switches.

Tank Foundations

Use insulating units between tank bottoms and tank foundation.

Any type of foundation that will stand the weight of the tank is suitable provided an effective insulating unit is placed between the tank bottom and the tank foundation. What is an effective insulating unit? A glass or glazed brick (note: never a porous brick) covered with a drip shield or umbrella to protect it from drippings (see Fig. 1). However, be sure the drip shield does not short the insulator by touching the foundation (see Fig. 2). The drip shield may be made of lead or any corrosion resisting material.

Heating Coils

Insulate both ends of steam coil. The importance of insulating the steam coil from ground is generally recognized. However, some instances have been encountered where the outlet end of the coil was in contact with a metallic sump line. In other instances special insulating joints placed ahead of the coil have been ineffective because of improper installation of the joint. In order for insulation to be effective, both ends of the coil must be electrically insulated from external surroundings.

The use of a foot length of rubber hose at both ends of the coil is generally satisfactory. Attention is invited to the fact that rubber tubing may be insulating or non-insulating. Be cer-

tain that the insulating type is used.

Ventilators

Insulate ventilators from the tank and from other surroundings. It is difficult to keep ventilators free of metallic contact with plating tanks. In order to prevent stray currents from passing through ventilator ducts it is recommended that insulating sections be inserted in the duct work leading from each plating tank. Insulating sections can be made from any available insulating material in sheet form (e.g. rubber, polyethylene, polyvinyl chloride, etc.). This insulating material is wrapped around a gap or free space in the duct work and held in place by steel bands. In this way stray currents are prevented from traveling through the duct work. This method of insulating ventilating ducts permits rapid dismantling for frequent cleaning of the insulating material.

Bolted Joints

Use properly insulated bolted joints when hanging coils in non-metallic lined tanks.

Lead coils are often hung in steel tanks that have been lined with non-metallic materials. The coil hangers are generally fastened by bolts to the upper edge of the tank. In such cases the hanger bolts often provide a low resistance electrical path between the coil and ground. The use of insulating bushings around the bolt shaft, insulating washers under the bolt heads and nuts, and between the coil hanger and tank edge will prevent such grounding (see Fig. 3). The bushings and washers can be made of rubber, laminated plastics or other available insulating materials.

Insulator Maintenance

Keep insulators clean and dry. The importance of proper insulator maintenance cannot be overstressed. All the work of insulation can go for nought if condensing acid vapors are allowed to accumulate on an insulator.

Insulators should be located where they will be dry and accessible for frequent cleaning. Clean all insulators periodically in order to maintain their

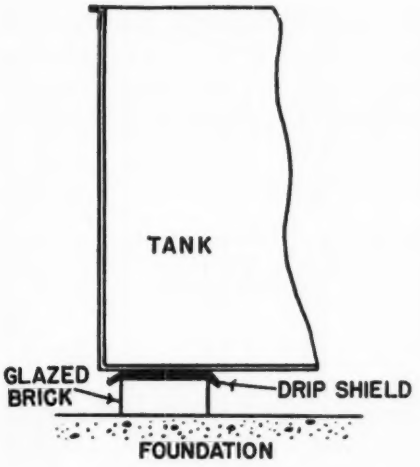

Fig. 1—Effective insulating unit insulating tank from foundation
(Illustration courtesy American Smelting and Refining Company)

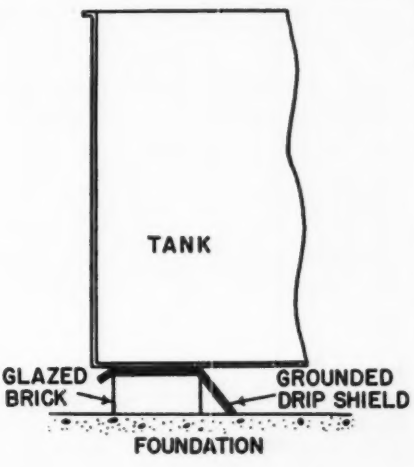

Fig. 2—Ineffective insulating unit because of grounded drip shield
(Illustration courtesy American Smelting and Refining Company)

effectiveness. A wet and dirty insulating unit can be responsible for grounding of equipment. Drip shields are used

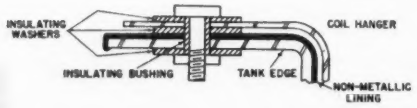

Fig. 3—Method of bolting coil hanger to edge of steel tank lined with non-metallic material (*Illustration courtesy American Smelting and Refining Company*)

to help keep insulators dry. It is up to operators to keep insulators clean by regular maintenance. Steam cleaning of undertank insulators is probably the quickest, easiest and most effective method of cleaning these hard-to-reach insulators.

Bi-Polar Action

Beware of bi-polar or intermediate electrode action involving plating tank or accessories.

Keep the same geometrical relationships within the tank as were specified when it was originally designed. Examples of how, often inadvertently, the original geometrical arrangement can be altered follow: (1) substituting longer anodes; (2) changing the type and dimensions of the heating coil; (3) plating work larger than that for which the tank was originally designed; (4) dropping pieces of metal (work or anodes or other metal) into the tank.

Normally the current is expected to travel directly from the anode to the work or cathode material. If the original design relationships are altered it is possible that a devious path, involving equipment, will be provided for the current (see Figs. 4, 5, and 6). These paths, while not the shortest, may be of a resistance low enough to permit the passage of considerable quantities of current. Bi-polar action is the result. Areas where the current enters the metal from the electrolyte will be cathodic. Similarly, those areas where the current leaves the metal to enter

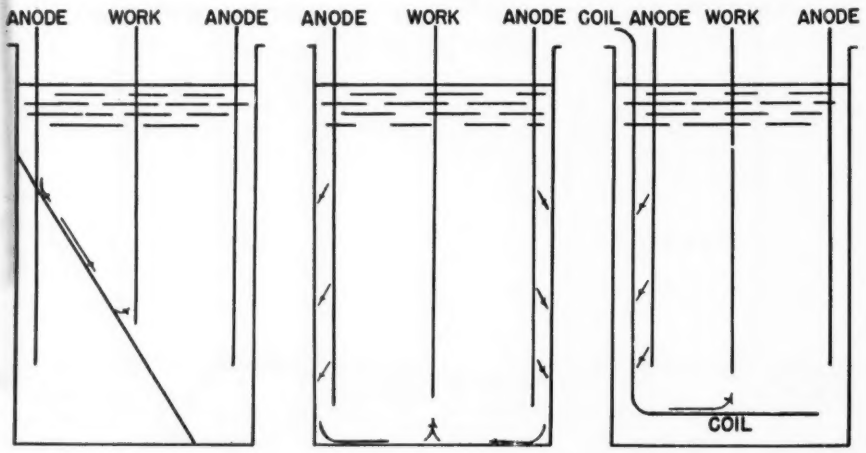

Fig. 4 (Left)—Stray piece of metal acting as a bi-polar electrode. Fig. 5 (Center)—Metallic tank lining acting as bi-polar electrode because of anodes and work placed too deep in tank. Fig. 6 (Right)—Coil acting as bi-polar electrode because of work extending too deep in tank. (Note: In each case normal current path should be from anode across to the work.) (*Illustrations courtesy American Smelting and Refining Company*)

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the electrolyte will be anodic. Corrosion will result at one or another area depending upon the metal and the electrolyte involved.

Summary

For long equipment life, and freedom from premature failures due to stray current, it is recommended that the following precautions be observed:

1. Use double pole switches so that all tank bars are disconnected from all of the main bus bars when the tank is not in use.
2. Use adequate insulating units between electroplating tanks and their foundations.
3. Insulate heating coils and ventilators from their surroundings.
4. Maintain all insulators clean and dry to insure their maximum effectiveness.
5. Prevent bi-polar action from developing in your installation.

Red Lead Technical Letter No. 4, published by the Lead Industries Association, 420 Lexington Ave., New York 17, N. Y., includes several of the latest type corrosion inhibitive paint formulations for the protection of iron and steel exposed to marine conditions. Complete detailed formulations of high performance synthetic vehicle paints for marine atmospheres, intermittent salt water immersion, and continuous salt water submersion are presented.

Ramco Spotless Drier, which employs cold-hot air blasts to displace all water and moisture and dry parts without spots or stains, is discussed in a leaflet available from the Randall Manufacturing Co., Inc., 801 Edgewater Rd., New York 59, New York.

Bulletin W-102. The Hanson-Van Winkle-Munning Co., Matawan, N. J., has published Bulletin W-102 which describes its complete line of polishing wheels and accessory products.

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Assembly-Welding and Finishing Protectobodies

Employing aluminum and steel construction, and incorporating certain principles of aircraft design, Hobbs produces an attractive, lightweight truck body for delivering Coca-Cola. The body is finished in high gloss enamel and trimmed with stainless clad steel.

By ROBERT I. SHORE

THE desire to deliver Coca-Cola to the vendor or user in a clean, dust-free condition, unfrozen in cold weather and cool in hot weather, can now be solved with the Hobbs Protectobody. Designed by Raymond Loewy Associates, and engineered jointly by representatives of the Standardization Committee and the Hobbs Manufacturing Company, the Protectobody is a light, yet strong, attractive, efficient unit especially suited to accomplish this object. The Protectobody which is manufactured solely by Hobbs for national distribution has been approved by the Standardization Committee of Bottlers of Coca-Cola.

Designed and engineered to fit every type of truck chassis in current use,

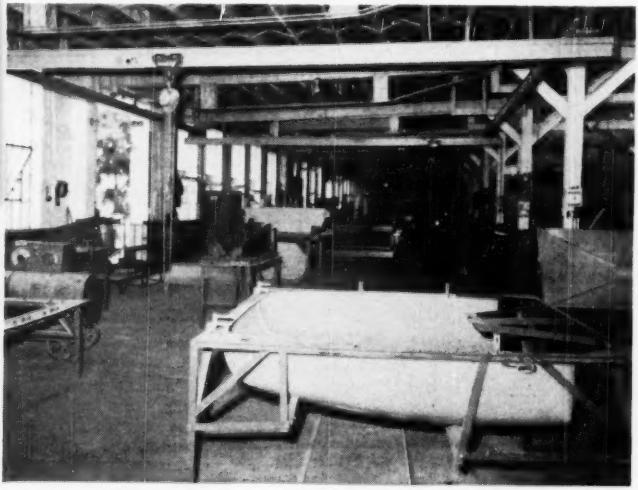


Fig. 1—A view of the well-arranged assembly floor down which the stampings progress through subassembly. In the foreground can be seen an aluminum section mounted in a special jig for riveting to the corresponding steel bulkhead. In the background resistance and arc welders are positioned through the department to secure maximum operating efficiency.

the bodies, as illustrated in the accompanying photographs, are manufactured in the open and closed rack types, and the pallet type, and available in capacities varying from 184 to 338 cases, to fit the varying requirements of bottlers of Coca-Cola. Celotex insulation in the body roof, glass wool insulation in the aircraft-type, spring-counterbalanced, vertically-operated doors, and sound deadener used in critical areas are additional unusual and interesting features of the body.

Steel and aluminum stampings and formed sections to be assembled into Protectobodies are delivered to the Hobbs' San Antonio plant, which is designated as the Protectobody Division, from the Hobbs' Fort Worth plant or from contractors. The aluminum sections, which form the front and rear portions of the body, are phosphatized and protected with one coat of Kem Sanding Primer Yellow, reduced 50 per cent with Kem Reducer, prior to delivery. Steel formed sections are sprayed with oil upon receipt, and stored until scheduled for assembly. They are then cleaned with naphtha and proceed to the assembly and finishing operations.

Aluminum body ends are joined to steel bulkheads by riveting. This is accomplished in special jigs, as illustrated in Fig. 1. Steel sub-assemblies are manufactured by resistance welding, as pictured in Fig. 2, or by arc or torch welding.

Sub-assemblies, which have progressed to the point that they can be built into the body itself, are hung on an overhead roller conveyor and transported for priming into a room-type spray booth, fitted with tight doors at each end, and equipped with a floor-level air inlet and overhead exhaust system to carry away overspray paint. The spray booth walls are coated with Kelite spray booth paint and can be cleaned as necessary by sweeping to remove accumulations of body paint dust or overspray.

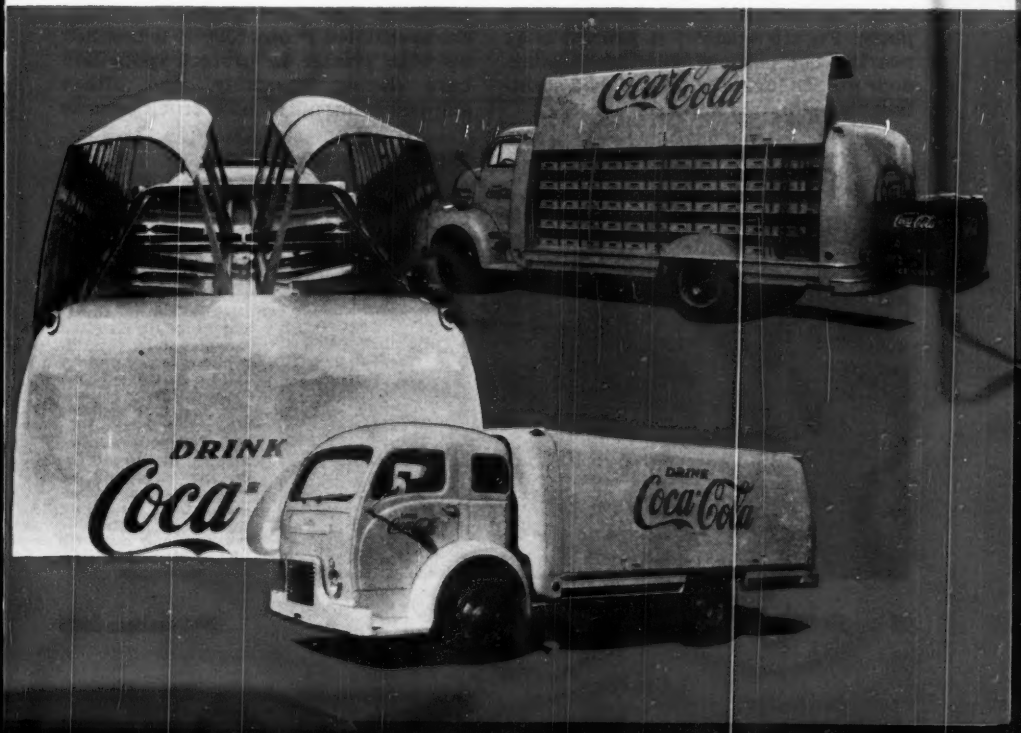


Fig. 3—This illustration shows a view of a Protectobody about mid-way through sub-assembly. The primed parts, such as bulkheads, frame supporting members, case racks, wheel wells, and floor sections have been positioned and the body is now ready for the overhead doors and guide rails to be attached.

Parts to be primed are cleaned and sprayed with either Du Pont Preparakote High Solids Yellow, reduced about 50 per cent with Du Pont Dulux Special Thinner, or Kem Sanding Primer Yellow, reduced 50 per cent with Kem Reducer. Two wet coats of the primer, supplied from DeVilbiss pressure spray tanks, are applied to the steel parts, after which the parts are returned to the assembly floor for drying and assembly into the Protectobody. Figure 3 is a view of a partially completed body with the bulkheads and case racks in place. Figure 4 shows a primed body nearing completion, with doors hung, door guides tacked, and polished stainless clad rub rails in place.

Bumpers and rub rails, formed from stainless clad steel, are smoothed to a satin finish in two operations. The first polishing operation is performed with a 120 emery abrasive belt, supported by a ventilated-type buff and used with a Porter-Cable backstand. A final satin finish is secured by polishing the parts on a Vonnegut head wheel, made up with sections of 240 emery paper supported by brush bristle stiffeners.

Some bottlers prefer to apply the finish enamel and decorative identification in their own shops. For them, the assembled Protectobody is touched up with primer to protect spots laid bare during assembly, and either shipped or mounted on a truck chassis

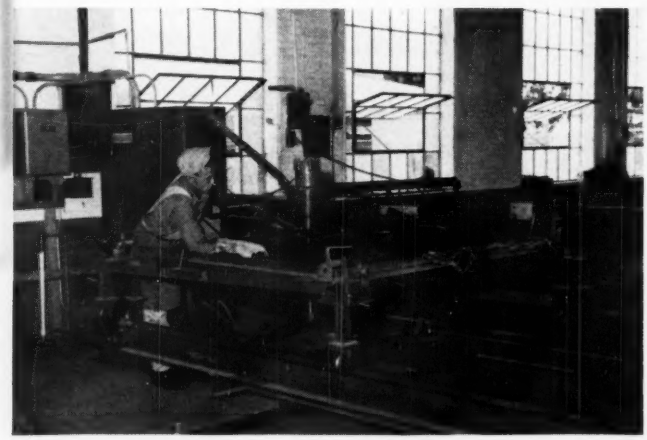


Fig. 2—This view illustrates a typical resistance welding assembly setup, showing how controlled movement in two directions is secured by jigs mounted on track-guided rollers. The operator controls the action of the Progressive spot welder, moving the jigged assembly smoothly in one direction to secure the proper number of resistance welds along each rib of the bulkhead subassembly.

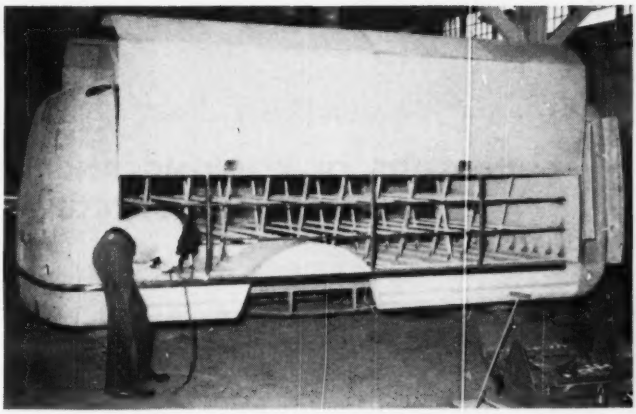


Fig. 4—Using a Lincoln portable arc welder, this operator is attaching door guide rails to the nearly completed body assembly. Aircraft-type spring-loaded doors have already been hung, and will remain in the open position without being supported.

supplied by the purchaser. If the body is to be completely finished in the Hobbs Company plant, putty is applied at the seams where necessary and, after the putty is dry, the entire body is then sanded with 360 emery paper.

Following the sanding operation, a mist coat and full wet coat of Du Pont Automotive Dulux 93-6969 Yellow, or Kem Transport Yellow No. 33, is sprayed on. This coat is allowed to air-dry and a third coat applied if necessary to secure the desired gloss or hiding effects. Then the distinctive Coca-Cola insignia is applied, using either Du Pont 93-20888 Red or Kem No. 40 Red Enamel.

The Protectobody is now ready to be shipped to a Coca-Cola bottler, or mounted on a chassis to be placed in immediate service for supplying soft drink consumers with clean bottles of a popular beverage.

"Synthetic Detergents—Their History and Applications" is the title of a new descriptive folder just issued by Antara Products, General Aniline & Film Corporation, 444 Madison Avenue, New York 22, New York.

Written in non-technical language, the folder is designed to acquaint laymen buyers of detergents with simple facts about these materials which are usually explained in heavy scientific terms.

The folder defines both detergents and synthetic detergents and explains the need for the latter in industrial and other fields.

The three general types of synthetic detergents—anionic, cationic, and non-ionic—are explained, along with the advantages of each type.

An easy-to-use chart gives the name, type, family, and uses of 19 Antara Products' Surface Active Agents known as the Antarox, Antaron, and Antarane families.

Dustkop Dust Collectors. A 36-page catalog and price list descriptive of Dustkop unit type dust collectors contains specifications and information on entirely new models, improved models, and illustrations of applications of Dustkops on grinding, buffing, polishing, sanding, and other dust-creating operations. A separate section is devoted to vapor collectors. Several case histories and a "dual" index are also contained in the catalog, which is available from the Aget-Detroit Co., Main at Washington Sts., Ann Arbor, Michigan.

Ertel Liquid Handling Equipment, including filters, filter sheets, vacuum bottle filters, pumps, mixers, and cappers, is described and illustrated in a 16-page catalog issued by the Ertel Engineering Corp., Kingston, New York.

Seventeenth Annual Convention and Exhibit

INSTITUTE OF COOKING AND HEATING APPLIANCE MANUFACTURERS

DECEMBER 5, 6, AND 7, 1949
NETHERLAND PLAZA, CINCINNATI

MONDAY, DECEMBER 5

MORNING	Board of Trustees Oil Division Technical Section
NOON	Luncheon Meeting of Kerosene Stove Division
AFTERNOON	Electric Range Division Export Committee Oil Division Executive Committee Sleeve-Type Burner Division

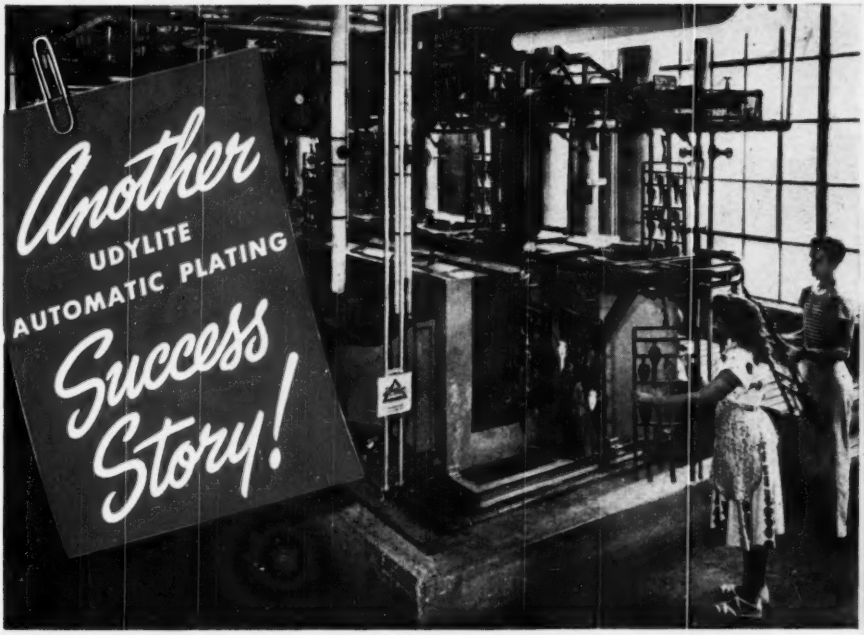
TUESDAY, DECEMBER 6

MORNING	General Convention Session
AFTERNOON	Management Forum
EVENING	President's Reception and Banquet

WEDNESDAY, DECEMBER 7

MORNING	Gas and Combination Range Division Gas Space Heater and Floor Furnace Division Oil Division Solid Fuels Division
AFTERNOON	Credit Managers Financial Executives and Accountants Labor Relations and Factory Management Officials Sales, Advertising, and Marketing Research Officials

EXHIBITS OF MATERIALS, COMPONENTS, EQUIPMENT, AND SERVICES USED IN STOVE PRODUCTION WILL BE OPEN DURING THE ENTIRE CONVENTION.



Production Stepped Up 25%—Now 1500 Parts Per Hour!

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HDW. & MFG. CO., Inc.
Makers of the Famous

Rollfast
ROLLER SKATES

● You can get results like these in YOUR plant, just as the Rollfast people did, by a simple and quick conversion to Udylite automatic machines.

You'll be miles ahead by choosing *Udylite*, because of important "hidden" values like these that don't show up in the initial estimate:

No long tie-ups in the plating room during installation—Udylite machines, shipped ready to run, can usually be installed over a week-end, and require but a few machinery movers. These compact machines require less working space, solving the load-and-unload space problem. Racks are within easy reach. And Udylite machines have astonished users with their low maintenance costs.

Write a "success story" like the one above in *your* plant—plan now to "go automatic" with Udylite equipment! We'll be glad to make recommendations, entirely without cost or obligation. Write *today*.

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CORPORATION
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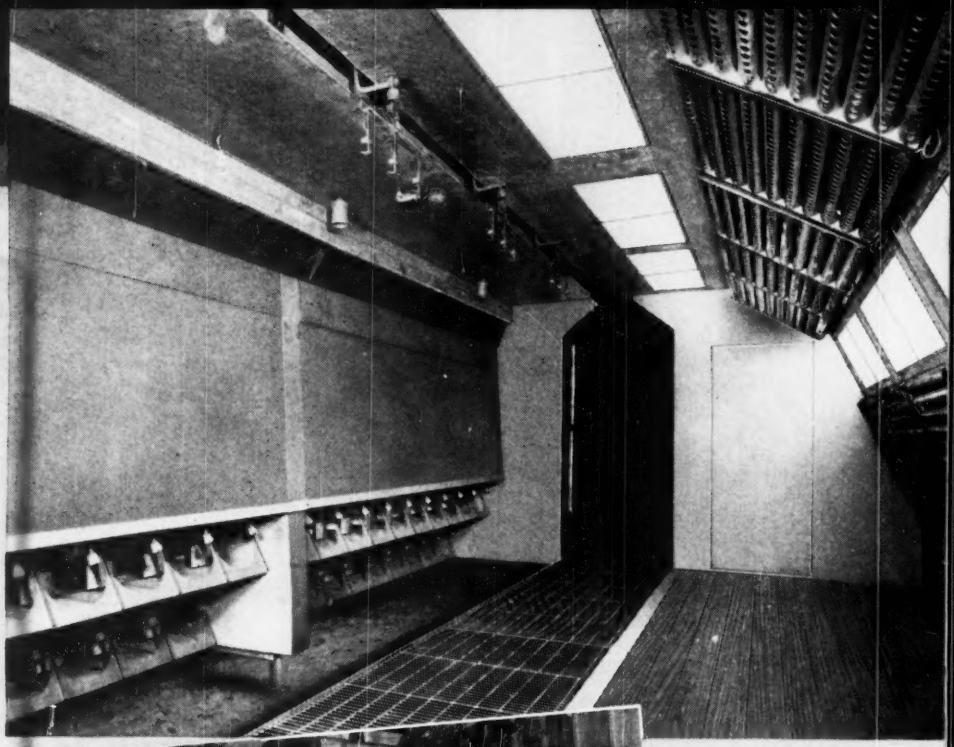
COMPLET



Right Above: General view of finishing enclosure showing pressurized up-tunnels to Finish Baking Ovens above. Above: Interior of Hydro-Filter Spray Booth which is supplied with filtered air The complete Finishing System includes a six stage Metal Cleaning and Rust Proofing Machine, Dry-off Oven, Japanning Dip Tank and Enclosed Drip Area, Dip Enameling Tank and Drip Area, Hydro-Filter Spray Booth and two Finish Baking Ovens located above—one for Japanned parts and one for Synthetic Enameled parts. Oven heating units are equipped for either Gas or Oil firing—switch may be made in a matter of seconds without interrupting production.

Japanning Dip Tank with Enclosed Draining Area in rear and Enclosed Drip Area at right. These areas are supplied with filtered air which is maintained at slight pressure.

M

E

Finishing SYSTEMS

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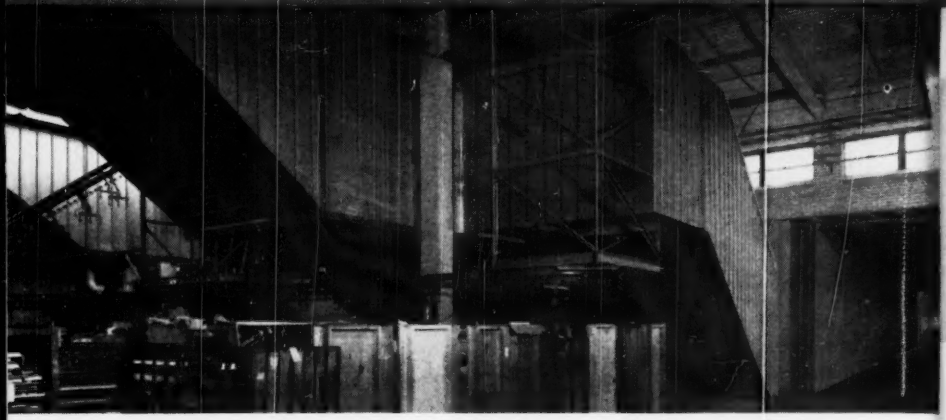

Where Lasting Beauty is Imperative, You'll Always Find MAHON ENGINEERED Finishing Systems!

To provide a large midwestern stove manufacturer with ultra-modern finishing facilities which would insure the finest finish obtainable at a minimum cost per unit, Mahon engineers designed a three-in-one finishing system that permits dip enameling, spray enameling, and japanning by the dip process. All parts pass through the cleaning and rust proofing machine and the dry-off oven. Parts to be japanned remain on the same conveyor, and are carried on through the japanning dip tank, drip area, and the pressurized up-tunnel to the baking oven. Parts to be dip enameled or spray enameled are transferred, after emerging from the dry-off oven, to a second conveyor line. On this finishing line, dip enameling and spray enameling operations are alternated to suit production requirements. When switching from dip to spray enameling, the synthetic enamel in the dip tank is dumped into storage tanks below, permitting parts to pass through the dip and drip zone into the Hydro-Filter Spray Booth for coating and thence through a pressurized up-tunnel to the Enamel Finish Baking Oven. This is a typical Mahon solution of the finishing requirements of one manufacturer. You, can also benefit from Mahon experience, which is world-wide in scope and covers every industry where finishing constitutes a major production operation. This experience, plus constant research and development, has endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available to you elsewhere. See Mahon's Insert in Sweet's Mech. Ind. File or write for Catalog No. A-649.

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HOME OFFICE and PLANT, Detroit 11, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Pickling Equipment, Metal Cleaning and Rust Proofing Equipment, Dry-off Ovens, Hydro-Filter Spray Booths, Filtered Air Supply Systems, and Drying and Baking Ovens. Also, Core Ovens, Hydro-Foam Dust Collectors, and many other Units of Special Production Equipment.

AHON

ALUMINUM— Its Surface Preparation and Finishing

Part II—Electroplating on Aluminum

By E. R. YARHAM,
Cromer, Norfolk, England

ELECTROPLATING is applied to aluminum surfaces for decorative effect and to obtain certain other advantages. Copper, brass, and silver are deposited on aluminum in order to provide surfaces which can be soldered by normal means, and brass may be applied to facilitate bonding to rubber. Silver is deposited on electrical equipment in order to obtain a surface of high electrical conductivity, and the precious metals, particularly gold, are plated on certain electronic equipment.

Castings to be electroplated must not only have good surfaces but for many applications must be free from internal porosity. For example, when the sole-plate of an electric iron is heated, any gas in the pores is likely to cause serious trouble to the plated deposit. Therefore castings for such purposes are inspected by X-rays prior to plating.

As aluminum is anodic to the metals commonly deposited on it (with the exceptions of zinc and cadmium), freedom from pores and discontinuities in the coating is essential. Although the plating metal cannot itself attack the basic metal, it may cause local electrolytic attack by acting as a cathode in the presence of moisture.

In addition to general plating considerations, there are three considerations of particular importance when the process is applied to aluminum: (1) the existence of the oxide coating on aluminum; (2) the rapidity with which that coating reforms on the surface that is being treated; and (3) the solvent effect of the electrolyte.

The oxide film which forms spontaneously on any freshly exposed aluminum surface is not a suitable base for electroplating because it prevents adequate adhesion of the deposit. This film must therefore be replaced by a deposit which will prevent the film from reforming and will form a base to which the electroplate bonds satisfactorily. This is done by dipping the article first in a solution which strips off the aluminum oxide and then in a solution which deposits a base suitable for electroplating. In the interval between pickling and plating, the metal must be immersed in a reducing solution to pre-

New Combustion Safeguard

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BRISTOL ELECTRONIC PYROTROL

for gas-fired appliances

This new Bristol instrument (1) makes it impossible to light gas appliances under unsafe conditions and (2) shuts down the appliance promptly if an unsafe condition develops during operation.

A Combination of Features Found in No Other Combustion Safeguard

(1) *No special tubes needed.* You can get replacements in any radio store.

(2) *No special electrode cable needed.* Use easily obtainable BX flexible cable on normal flames, lengths to 50 ft between electrode and Pyrotrol; commercially available coaxial cable for over 50 ft or abnormal flames.

(3) *You save on external wiring.* Power to operate main valve, pilot valve and ignition transformer supplied from Pyrotrol terminals.

(4) *Protects against unsafe start.* Safe-start relay prevents gas flow upon lighting off, should there be a leakage path in the electrode head or electrode cable of resistance value within normal flame operating range or a short circuit between electrode and ground.

(5) *Protects against tube failure.* Will shut down entire combustion system on loss of emission from any electron tube section.

(6) *No unnecessary shutdowns.* Prevents gas shutoff, in accordance with accepted insurance company standards, due to momentary flame flicker.

(7) *Unaffected by dust.* Completely dust-proof.

Write for Bulletin W1816. THE BRISTOL COMPANY, 108 Bristol Road, Waterbury 91, Conn. (The Bristol Co. of Canada, Ltd., Toronto, Ont.; Bristol's Instrument Co., Ltd., Lynch Lane, Weymouth, Dorset, England.)

60 YEARS ... 1889 - 1949

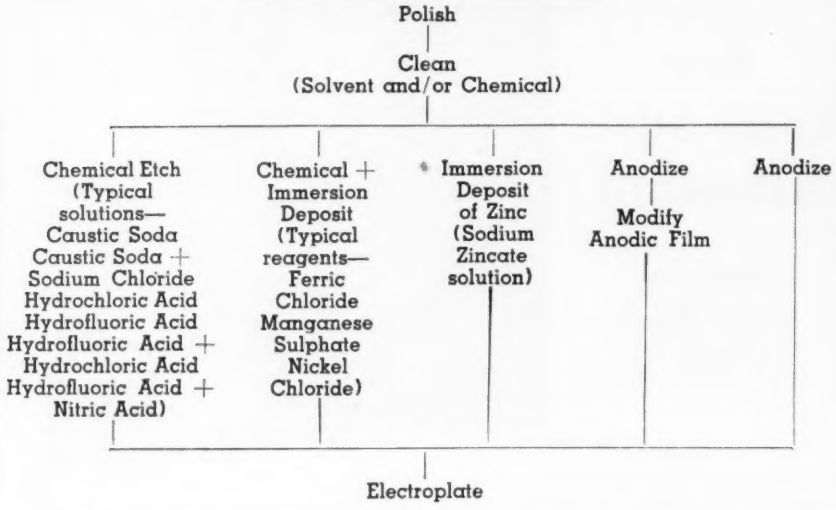
BRISTOL

Gives You the Most from Heat

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Table I

Plating Processes for Aluminum



vent oxidation.

The position of aluminum in the electrochemical series is such that it readily displaces most common metals from solution. If aluminum is dipped into any one of a number of plating solutions, immersion deposits are primarily formed, and these prevent good adhesion of the electroplate. One remedy is to coat the metal before plating with a metal close to itself in the electrochemical series. Another method is to form a modified anodic film on the metal surface. This film forms a bond between the surface and the electroplate and improves resistance to corrosion.

Special attention must be given to the preparation of the original surface and to the conditions of deposition of the first metal coating. A coarsely roughened surface causes poor adhesion. If high-gloss coatings are required, the material must first be buffed to a high luster.

Plating solutions must be such as to have the least possible chemical action on the metal, not only while it is immersed in the solution, but afterwards because minute drops may be retained within its pores. When only the outer surface of an article (such as a teapot) has been plated, the inside must be scrupulously cleaned by pickling, or else galvanic cells formed between small deposits of plating metal and the aluminum are likely to cause serious corrosion.

There are three distinct types of operations common to all of the commercial plating processes: (a) cleaning, (b) preparation of the surface, and (c) deposition of the coating.

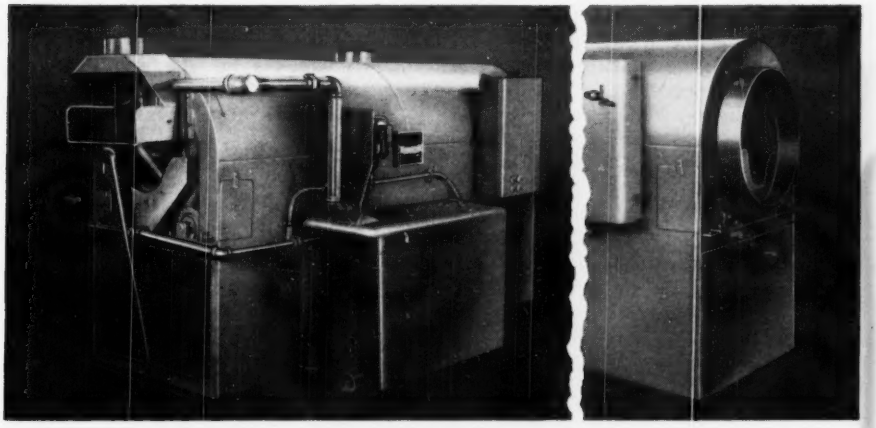
Surface Preparation

After cleaning, further preparation varies according to the surface required for plating and consists of various combinations of the following processes: (see also Table I)

(a) Chemical etching.

(b) Simultaneous chemical etching

Specially Priced to Participants In a Group Production Plan!



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Is Now Available In the Performance Proved

RANSOHOFF STANDARD 24" DRUM TYPE CONTINUOUS PROCESS METAL PARTS WASHING MACHINE

that ideally serves plants of all sizes for the most efficient and satisfactory cleaning of STAMPINGS, SMALL CASTINGS, SCREW MACHINE WORK.

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and the formation of an immersion deposit.

(c) Immersion deposit of zinc.

(d) Anodic oxidation followed by modification of the oxide film. This action is one of enlarging the pores, and possibly undercutting the bases of the oxide film, to give a better key for the plating deposit.

(e) Anodic oxidation to produce a porous film which permits direct plating without removal of the oxide.

The choice of preparation will depend partly upon the alloy and the article to be plated and partly upon the use to which the plated surface will be put. For example, when a surface is to be plated in order to obtain high electrical conductivity, the anodic treatments cannot be used because of the insulting properties of the oxide film. Again, where the article has a large surface area and an irregular shape, it is difficult to produce an even oxide film over the whole surface area, and an immersion deposit process may prove the most satisfactory.

The improved adhesion of the coating obtained as a result of roughening by chemical etching is attributed to the type of pit produced. Specific etching treatments have been developed to produce pits of an undercut nature which provide a mechanical key for the deposit.

A typical chemical etching treatment for castings developed by Work is:

Nitric acid (sp. gr. 1.42)_____3 vol.
Hydrofluoric acid (50 per cent)__1 vol.
Temperature _____75-80 deg. F.
Immersion Periods
Pressure die-castings ____15-30 sec.
Gravity die-castings _____30-90 sec.
Sand-castings _____60-120 sec.

After such treatment a preliminary brass flash is often deposited on the surface. The plating solutions and pro-

NEW

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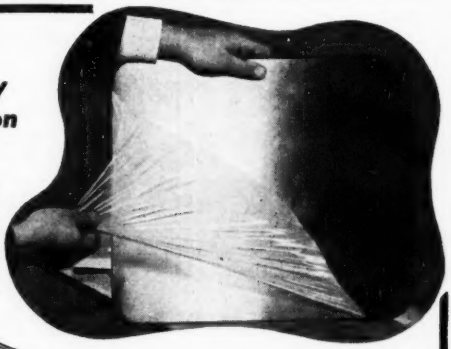
This new Striplastic Strippable Spray Booth Coating is shipped in a consistency so that it can be extended 20% or 30% by the addition of an inexpensive reducer. Ask us how.



THE STRIPLASTIC COMPANY

Among many advantages, it is non-toxic, possesses great tensile strength and is easily stripped off in one piece. Write for complete information on this new strippable plastic.

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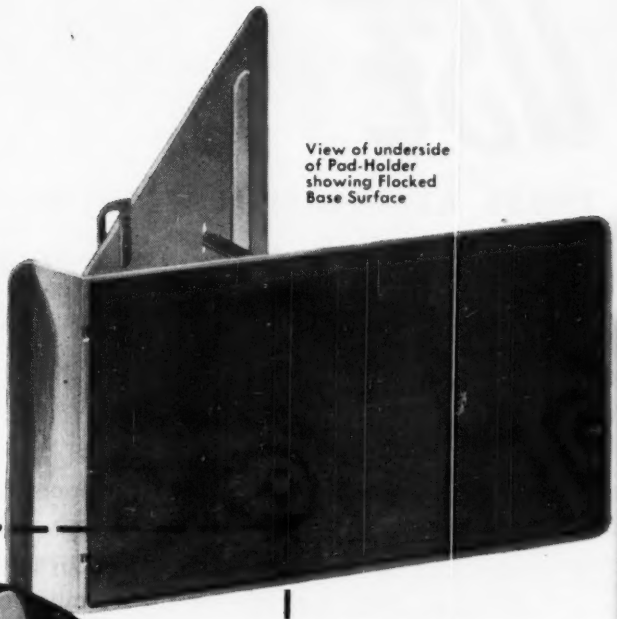
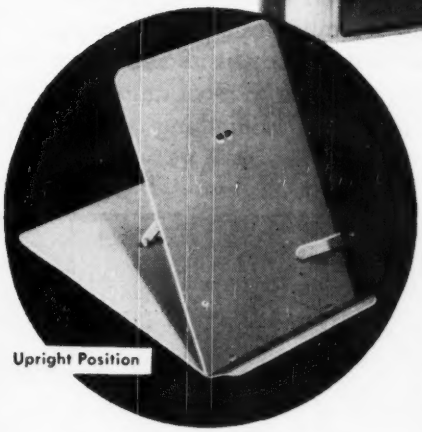
The Base Plate of this STENO PAD-HOLDER* is *Mar-proofed* with FLOCK —



View of underside of Pad-Holder showing Flocked Base Surface



Upright Position

*Item pictured is "The Stellar Steno-Pad-Holder" (patented), manufactured by Stellar Tool & Mfg. Co., Inc. of Jamaica, New York. Flocking-Bestcraft Products Co., Inc., New York City

Flock Finishing Operation Doubles for Felt —*and Saves as it Serves!*

Here an inexpensive Flocked Paper lamination eliminated any possibility that this stand would topple, slide or scratch. Manufacturer also reports this flocked feature as being helpful to the item's market acceptance.

Available at paper merchants, flocked stock for finishing operations is at its best when processed with long stapled, uniform quality Claremont Flock. We also supply this medium in bulk, in colors, in quantity for special spray-on finishing purposes, surface coatings, insulation and decorative uses. Write for samples, color charts and complete details. Inquiries invited!

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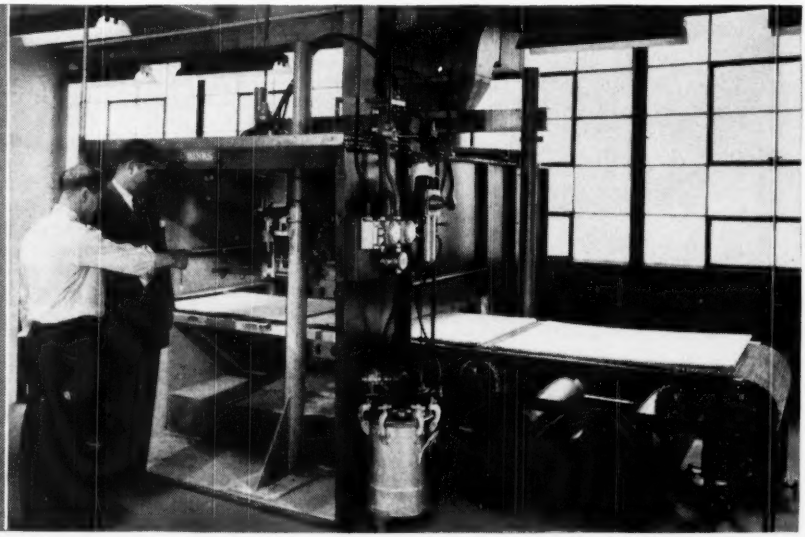
THESE AUTOMATIC FINISHING MACHINES

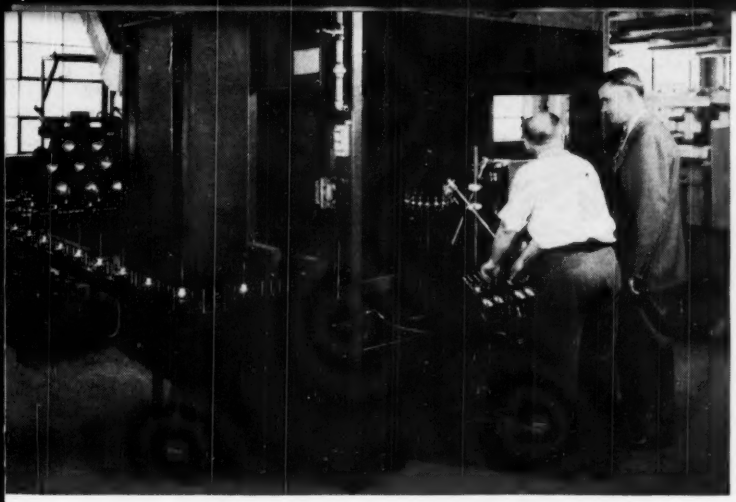
FREE

Try these machines out on your products at our expense. They may be the answer to lower finishing costs in your plant.

If you are looking for ways to speed up your finishing or to lower your finishing costs, through the use of automatic or semi-automatic equipment, stop beating your brains out. Let us show you how others are doing it. We have the answers to most automatic finishing problems...so why try to invent something that is already available and proved.



NEW YORK DETROIT LOS ANGELES ATLANTA BOSTON CLEVELAND DALLAS MILWAUKEE NASHVILLE



BINKS SPRAY SYSTEMS

If your product is flat, the chances are it can be finished on a Binks Automatic Reciprocating Machine of the type shown to the left. This machine has been adapted to everything from tea tiles to table tops.

If your product is round, cylindrical, or many sided, it probably can be finished on a Binks Automatic Spindle Machine (illustrated above) which spins the product in front of the spray guns. Its adaptions are myriad...everything from golf balls to automobile wheels.

These machines, and others, are set up under actual plant conditions in our Customer Service Department. You are invited to use them without cost of any kind to determine their adaptability to your particular problems. Our engineers will cooperate in every way.

"...lower production costs is the answer to increased sales...and profits!"

J. E. Roche
Chairman of the Board

PLEASE ACCEPT THIS INVITATION

Binks

Binks Manufacturing Company,
3118-40 Carroll Ave., Chicago 12, Ill.

Please send me full instructions on how I can try out Binks automatic finishing machines on my products without cost or obligation of any kind.

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COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

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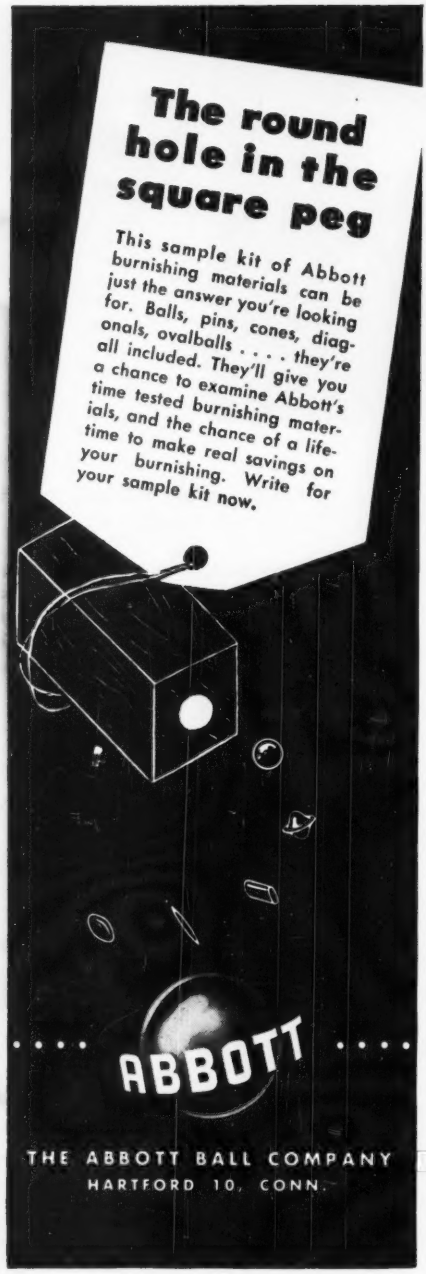

The round hole in the square peg
This sample kit of Abbott burnishing materials can be just the answer you're looking for. Balls, pins, cones, diagonals, ovalballs . . . . they're all included. They'll give you a chance to examine Abbott's time tested burnishing materials, and the chance of a lifetime to make real savings on your burnishing. Write for your sample kit now.
ABBOTT
THE ABBOTT BALL COMPANY
HARTFORD 10, CONN.

cedure are generally similar to those described under the zinc-immersion process.

In the case of chemical etching accompanied by metallic deposition, the depth of the chemical etch may be controlled by the simultaneous metal deposit. In the earliest processes of this type, solutions of metals cathodic to aluminum were always used; these included solutions of iron, manganese, nickel, and tin. More recently an immersion deposit of zinc has been applied, and since zinc is anodic to aluminum, such a deposit has a better protective value. The electroplate is probably formed over the immersion deposits from these solutions, but in many other procedures the immersion deposit is either partly or completely dissolved in the bath as electroplating proceeds.

Recommended solutions for the depositions of nickel and manganese, developed by Work, are as follows:

(1) For Commercial-purity Aluminum

Nickel chloride	45 oz./gal
Hydrochloric acid (sp. gr. 1.18)	26 fl.oz./gal.
Temperature	90 deg. F.
Immersion period	15-30 sec.

(2) For Wrought Alloys

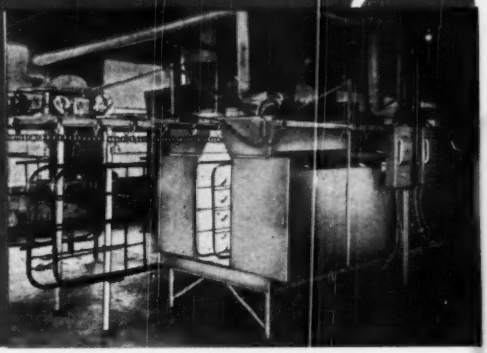
Manganese sulfate	0.75 oz./gal.
Hydrochloric acid (sp. gr. 1.18)	64 fl.oz./gal.
Temperature	90 deg. F.
Immersion period	15-30 sec.

Several iron solutions give deposits on which nickel and copper may be successfully plated. The iron immersion deposit is a suitable preparation for depositing a considerable thickness of hard chromium on aluminum, either direct or following a deposit of copper or nickel.

A commonly used iron solution contains:

Ferric chloride solution (sp. gr. 45 deg. Bé)	48 fl.oz./gal.
Hydrochloric acid (sp. gr. 1.18)	16 fl. oz./gal.

Your Best Buy in Infra-Red Ovens is JENSEN



WHEN the chips are down and "cost" is close-up in the picture, alert manufacturers choose JENSEN infra-red ovens over all others. Here's why: *Only* Jensen gives you "Nested Lamps!" *Only* Jensen gives you "Dual Heat!" *Only* Jensen gives you Jensen engineering!

Photo above shows a Jensen installation at the Oran Company, Columbus, Ohio. Oran finishes items for other manufacturers, and due to efficient production methods—*like Jensen ovens* —usually does the job at LOWER COST than the original manufacturers could do it themselves!

Jensen "dual heat" Infra-Red Ovens are designed to industry's specific needs. Write us about your problem today!

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In Finishing Production . . . the Future Belongs To Men Who *Plan* For It!

Temperature _____194-203 deg. F.
Immersion period _____10-60 sec.
(until a thin grey uniform deposit is formed)

In the zinc immersion process, which is the most important of the immersion processes, the deposit is formed by dipping the metal in a solution of sodium zincate. The mechanism of the reaction is:

(1) Removal of oxide film produced in the course of surface preparation
(2) Removal of the exposed aluminum surface film
(3) Replacement of dissolved aluminum by zinc

The presence of copper in the solution is said to slow down the reaction between the sodium zincate and the aluminum, so that it can be more easily controlled.

Successful formation of the zinc immersion coating depends chiefly upon the initial surface preparation, and thorough cleaning is essential to the formation of an adherent coating free from blisters. There are slight variations in process according to the nature of the alloy treated, but typical procedures for wrought and casting alloys respectively are as follows:

Procedure for Wrought Alloys
(1) Preliminary cleaning
(2) Chrome pickle
(3) Rinse
(4) Dip in concentrated nitric acid
(5) Rinse
(6) Zinc immersion treatment
(7) Rinse
(8) Electroplate

Procedure for Casting Alloys
(1) Preliminary cleaning
(2) Nitric acid dip
(3) Rinse
(4) Caustic soda dip
(5) Rinse
(6) Mixed acid dip
(7) Rinse
(8) Nitric acid dip
(9) Rinse
(10) Zinc immersion treatment
(11) Rinse
(12) Electroplate

A flowsheet for these procedures and for the special case of the casting alloy AC6 (13 per cent silicon) is given in Fig. 1.

The preliminary cleaning consists of the vapor degreasing and alkaline cleaning treatments already described. Complete removal of soap film by thorough rinsing in soft water is essential, otherwise the subsequent zinc deposit may blister. At least two rinses in cold water or a pressure spray rinse are required, and after this, the work should be racked ready for further treatment.

The chrome pickle solution is made up as follows:

Chromic acid _____5.6 oz./gal.
Sulfuric acid (sp. gr. 1.84)
_____1.75 lb./gal.

This solution is used at a temperature of 150 deg. F., and the immersion peri-

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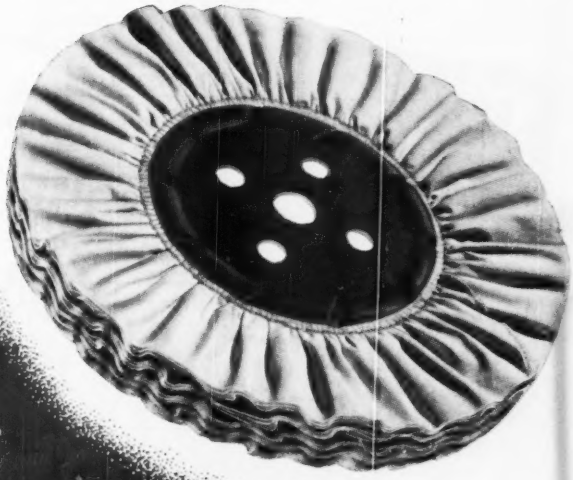

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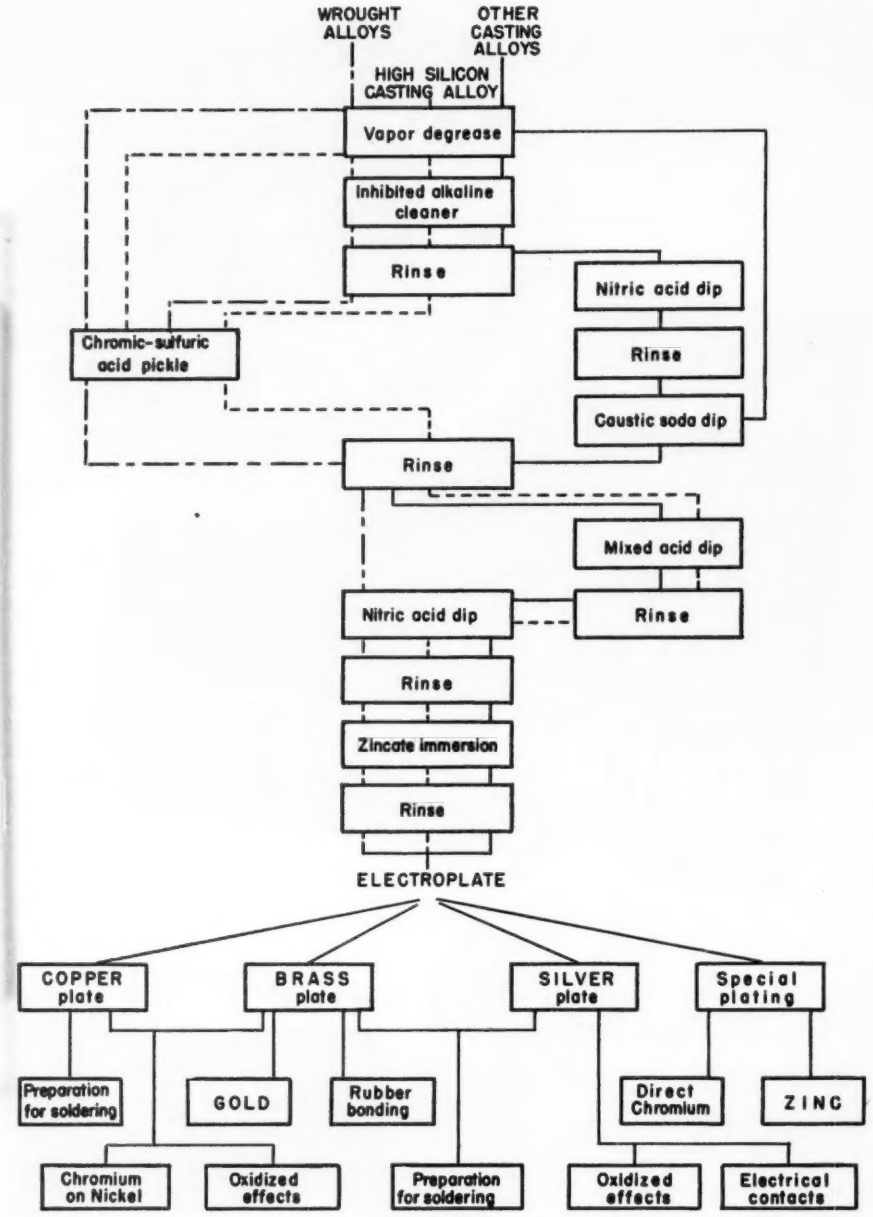

Fig. 1—Flow sheet for zinc-immersion process on aluminum with an indication of several end uses for the plated product

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od is 1 to 5 minutes. A steel tank lined with 6 per cent antimonial lead should be used, and this should be fitted with an antimonial-lead steam tube for heating, and a perforated tube for passing compressed air into the electrolyte to agitate it.

For aluminum-magnesium-silicon alloys, 0.5 per cent by volume of hydrofluoric acid may be added to the above pickle. The chrome pickle treatment produces a slight etch on the metal surface, which improves the adhesion of the zinc deposit without impairing the surface of the subsequent electroplate.

The caustic soda etching solution contains 5 per cent caustic soda and is used at a temperature of 150 deg. F. The work should be immersed for 5 seconds or until there is uniform evolution of gas over the surface.

Since most casting alloys contain silicon, treatment with hydrofluoric acid is necessary to remove the surface film of silicon that is left after pickling. The mixed-acid dip which replaces the chrome pickle used for wrought alloys is made up in the following proportions:

Hydrofluoric acid (48 per cent) ---------- 1 vol.
Nitric acid (commercial) ---- 3 vol.

The bath is maintained at room temperature, and articles are immersed for periods up to 30 seconds. The tank should be of welded steel lined with hard rubber, and it is important to avoid contact between nitric acid and the rubber when making up with concentrated acid.

The subsequent procedure is the same for both wrought and cast alloys, and consists of a dip in concentrated acid followed, after rinsing, by the zinc immersion treatment.

The improved adhesion of the immersion deposit given by the preliminary etching procedures is attributed to one or more of the following effects:

(a) Production of a slight oxide film

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(b) Production of slight surface pitting sufficient to form a key for the deposit
(c) Removal of impurities by dissolution from the surface

The sodium zincate solution is made up in the following proportions:

Zinc oxide (commercial grade) ----------16 oz./gal.
Caustic soda (commercial grade) ----------84 oz./gal.

The operating temperature is 80 deg. F. and the solution should be agitated. The immersion period varies from 2 to 5 minutes.

For deposition of zinc on alloys which contain copper, the strength of the solution should be reduced by 25 per cent. Alternatively, the zinc oxide may be replaced by a 35 per cent solution of zinc sulfate crystals.

The sodium zincate solution is very viscous, and drag-out losses may therefore be heavy. Such losses should be replaced and the solution checked from time to time to correct for dilution due to moisture carried in with the work.

Cast iron tanks, steel tanks, and rubber-lined tanks are all satisfactory. An iron pipe coil should be fitted for heating or cooling, and means provided for agitating either the work or the solution.

To prevent contamination of electroplating solutions with sodium zincate, thorough rinsing after immersion is essential. An economical arrangement is to use two rinse tanks arranged on the counterflow principle; a combination of dip and spray rinsing is also recommended.

There are two methods of producing a modified anodic film that is suitable for subsequent plating. The first is to form a normal film by anodizing and then modify it by use of a suitable solvent; the second is to control the anodizing conditions in order to produce a suitably modified film. There are various patented processes based on these methods.

Solution of the anodic film may be accomplished either by cathodic reduction in the plating bath or by simple treatment with a solution of sodium cyanide or hydrofluoric acid.

One of the best-known methods is that in which the anodic film is reduced cathodically in the plating bath. The original process involved three operations:

(1) Anodizing at 60 volts d.c.
(2) Reduction of the oxide with simultaneous deposition of a thin coating of brass at 5 volts
(3) Deposition of nickel or cadmium on the brass by any of the usual methods of electroplating

There have been several modifications of the original process, in some of which the procedure has been reduced to two stages.

In another process the anodic film is modified by separate treatment. The complete process consists of precleaning, anodizing, modification of the

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The entire Platecoil is electric welded and pressure tested. There are no joints to corrode or leak. Both connections to the Platecoil can be located above the liquid level where there is no danger of thread corroding and freezing.

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Weighing only about half as much as equivalent pipe coil, Platecoil is easy to handle. A whole maintenance crew is not needed to transport and install Pipecoil.

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Kold-Hold Manufacturing Company, Lansing 4, Michigan

oxide film, and plating.

When the surface has been degreased in trichlorethylene, it is cleaned in an alkaline solution of a type that has little etching effect on the metal, such as a 4 per cent solution of sodium cyanide. Cleaning takes approximately 2 minutes at room temperature but may be accelerated by use of a 6-volt direct current making the work the cathode in the bath. If dark stains persist on the metal, they may be removed by immersion in concentrated nitric acid. This treatment is followed immediately by a cold-water rinse and then, in the case of high-silicon alloys, by a dip in a 0.25 per cent solution of hydrofluoric acid. Hydrofluoric acid treatment is followed by a second dip in nitric acid and a final cold-water rinse.

The surface is then anodized in a 3 per cent solution of oxalic acid at room temperature. It is important that the temperature of the bath should not rise above 85 deg. F., and on long production runs cooling may be necessary. Either d.c. or a.c. may be used, and the required current density is less than 5 amp./sq. ft. Current is switched on at about 5 volts; and as soon as the anodic film begins to form, the voltage is increased rapidly to 50 volts and the treatment continued for a total time of 10 minutes. The work is then thoroughly washed with cold water.

The anodic film is modified in a bath containing 6 per cent by weight of sodium cyanide, or 0.25 per cent by volume of hydrofluoric acid in water at room temperature. As the percentage of hydrofluoric acid is critical, this alternative solution should be analyzed regularly. The time required for the modification treatment depends upon the density and hardness of the anodic film. It may be as much as 15 minutes for pure aluminum or as little as 5 seconds for the aluminum-copper alloys. The period is critical; and once it

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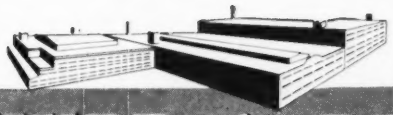

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has been determined, the treatment should be carefully controlled. The article should be immersed sufficiently long to produce suitable etching pits or pores in the film. The plated metal builds up from the bases of the pits, and the greater the number of pits the more uniform is the plated surface.

After modification of the anodic film, the work is washed and transferred to the plating solution. It must on no account be allowed to dry off between modification and plating, or stains will appear on the surface. If plating does not follow immediately, the work should be left suspended in the rinsing tank.

The prepared surface is suitable for the direct deposition of brass, nickel, cadmium, and silver from normal plating solutions, with the exception of baths of high pH value and baths requiring high working temperatures. If a highly alkaline plating solution is to be used, a thin flash coat must first be plated onto the anodized surface from an acid bath to prevent solution of the modified film in the alkaline solution.

In a direct method of forming a modified anodic film that is sufficiently porous to allow plating, the anodizing solution contains 3 per cent by volume of phosphoric acid, and the anodizing takes place at a temperature of 104 to 122 deg. F. and a voltage of 90 to 100 volts. The anodizing time is 5 minutes. Although operating conditions are adjusted to produce a porous anodic film, this method also relies on the alkalinity of the subsequent plating solution to remove part of the oxide.

The Aluminum Company of America has developed the phosphoric acid process and determined the operating conditions required to produce a film that is suitable for direct plating. These conditions vary according to the alloy concerned, and, in general, a much narrower range is permissible for nickel-plating than for copper-plating.

The phosphoric acid concentration itself is not specific, as other operating conditions may be adjusted in order to produce a suitable anodic film from a wide variation of electrolytic concentrations. A solution containing 30 per cent by weight of phosphoric acid is most frequently used.

If the acid concentration is decreased, the density of the film increases and its porosity decreases, the same effect being produced by increasing the anodic current density. The porosity of the coating is also decreased by increase in agitation of the solution, which produces a fall in temperature at the anode surface.

Plating Solutions and Conditions

Work that has been prepared for plating by an immersion deposit of zinc is usually given a preliminary strike in either a simple cyanide copper bath or a Rochelle salt type bath before further plating. Whichever

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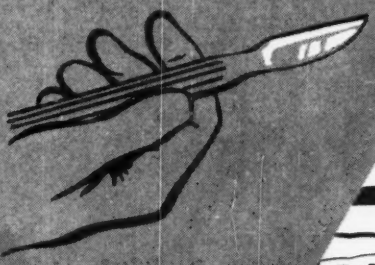

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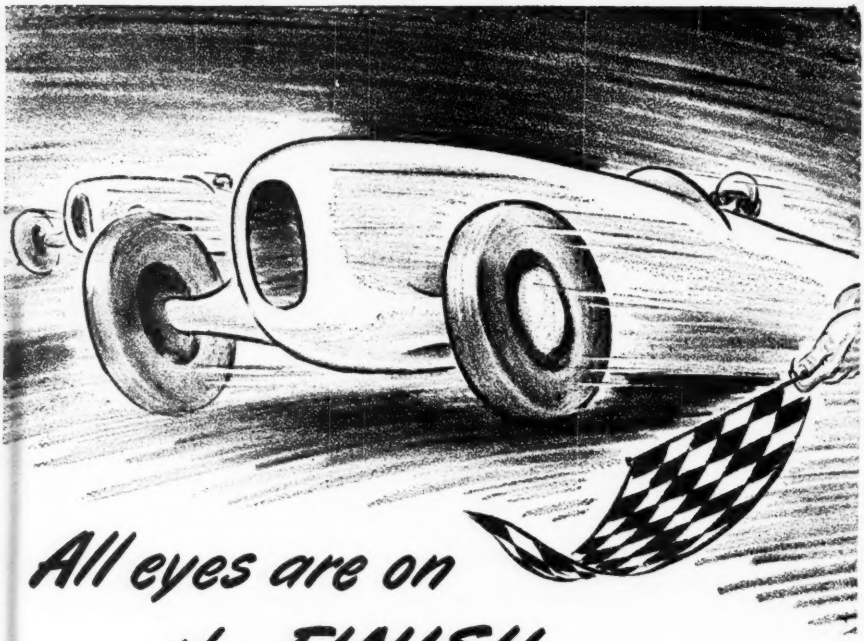

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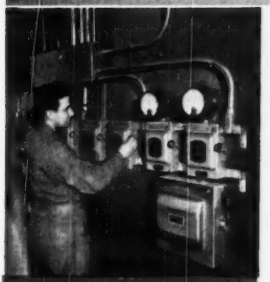

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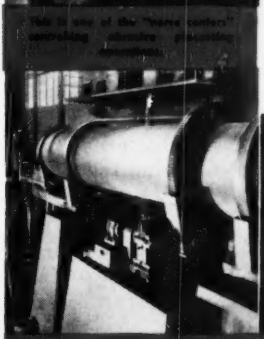

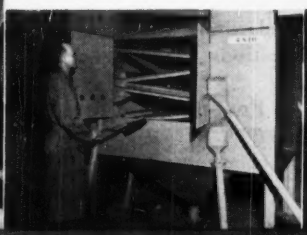

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bath is used, the pH value must be controlled to prevent the solution becoming too alkaline. The following solutions are suitable for the preliminary copper strike:

(a) Copper cyanide ____4.8 oz./gal.
Sodium cyanide ____5.4 oz./gal.
Sodium carbonate __0.6 oz./gal.

or

(b) Copper cyanide ____3.6 oz./gal.
Sodium cyanide ____4.8 oz./gal.
Sodium carbonate __2.4 oz./gal.
Rochelle salt _____9.6 oz./gal.

Solution (a) is operated at 130 to 140 deg. F. with a current density of 10 to 15 amp./sq. ft. The free cyanide content of this solution should not rise to 0.25 per cent and the pH should not exceed 11. Solution (b) is operated at the same temperature, the free cyanide content of the solution being maintained between 0.3 and 0.5 per cent and the pH not exceeding 12.

The thickness of the preliminary copper deposit should not be less than 0.0003 in., and the surface should be well rinsed before other plating is applied. If a heavier copper deposit is required, the work may be further treated in the same or a similar solution operated at a temperature of 85 to 105 deg. F. and a current density of 20 to 60 amp./sq. ft.

A preliminary deposit of brass is often chosen as an alternative to the copper deposit. A suitable brass plating solution is made up as follows:

Copper cyanide _____5.2 oz./gal.
Zinc cyanide _____1.5 oz./gal.
Sodium cyanide _____9.0 oz./gal.
Sodium carbonate _____4.8 oz./gal.

One pint of ammonia is added to each 100 gallons of this solution. On analysis this solution shows a free cyanide content of 3 oz./gal.

The bath is operated at a temperature of 80 to 95 deg. F. and a current density of 3 to 5 amp./sq. ft. The thickness of the deposit depends upon the immersion period and varies from

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0.0005 in. for a color coat to 0.002 in. for a buffing coat. All operating conditions must be carefully controlled if a uniform color is to be maintained.

After the preliminary copper or brass flash, nickel may be deposited from any of the usual nickel plating solutions. The following composition is suitable:

Nickel sulfate ..... 36.8 oz./gal.
Nickel chloride crystals .. 5.4 oz./gal.
Boric acid ..... 5.4 oz./gal.

This solution should have a pH value of 5.6 and be operated between 80 and 90 deg. F. at a current density of 10 amp./sq. ft.

Nickel may also be plated directly onto the zinc immersion deposit, and a recommended composition is:

Single nickel salts ..... 12 oz./gal.
Sodium sulfate crystals .. 24 oz./gal.
Ammonium chloride ..... 2.0 oz./gal.
Boric acid ..... 2.0 oz./gal.

The pH of this solution is maintained between 5.3 and 5.7. The bath is operated at room temperature at a current density of 10 to 20 amp./sq. ft. The thickness of the nickel deposit should be at least 0.001 in. to ensure maximum protection against corrosion; but if the thickness is greater than 0.001 in., there is danger of peeling when the plated article is bent. As deposited, the nickel is gray and has a smooth, glossy appearance which may be buffed to a high luster.

Chromium is usually deposited over the nickel, and for decorative purposes need not be more than 0.00002 in. thick. Chromium may also be deposited directly on the zinc immersion deposit, but if this is done an initial flash must first be deposited at 68 deg. F. This is followed by a heavier deposit at a higher temperature.

After the usual copper flash, tin may be plated on the zinc deposit from either sulfate or sodium stannate baths. A flash of nickel may also be deposited on the copper before tin plating, but this is not essential. A suitable tin plating solution is made up as follows:

Sodium stannate ..... 19 oz./gal.
Caustic soda ..... 3 oz./gal.

This solution is used at a temperature between 167 and 185 deg. F. The current density is 20 amp./sq. ft.

Cadmium may be successfully plated on the zinc immersion deposit provided the pH of the electrolyte is kept below 10. The work may be given a preliminary strike in a solution containing 1.25 per cent of cadmium and 5 per cent total sodium cyanide. After one minute in this solution it is transferred to a standard bath and plated in the usual manner. An alternative method is to use a preliminary flash of copper or brass and then cadmium plate from a solution containing 2.2 per cent of cadmium oxide and 9 per cent of sodium cyanide at a temperature between 70 and 95 deg. F. A coating 0.0005 in. thick is built up, using a current density of 15 to 45 amp./sq. ft.

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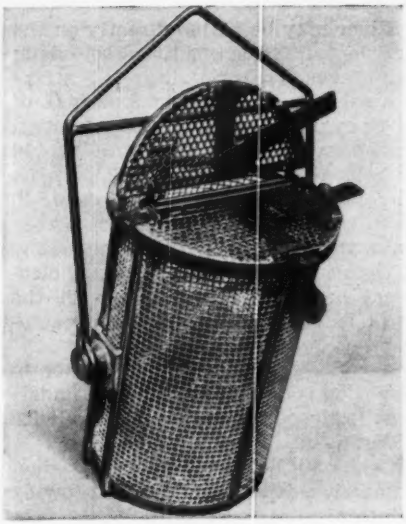

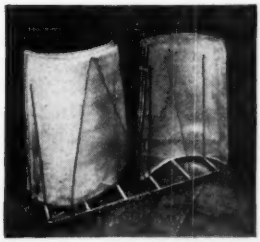

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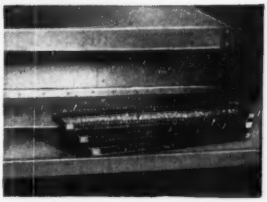

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Silver may be plated directly on the zinc deposit if the operation is done in two stages. The first stage is a strike in a solution containing 0.3 oz./gal. of silver cyanide and 12 oz./gal. of potassium cyanide. The temperature should be between 70 and 80 deg. F. and the current density between 10 and 40 amp./sq. ft. The second stage is to continue the plating operation from any of the usual silver plating baths, electrical contact being made with the work before it enters the silver solution.

A coating with better resistance to corrosion is obtained if a nickel undercoat is deposited before plating with silver.

Gold may be plated on to the zinc-immersion deposit from the following solution:

Gold	0.5 oz. troy/gal.
Total potassium cyanide	3 oz./gal.
Temperature	160 deg. F.

The rare metals—indium, platinum, palladium, and rhodium may all be plated onto aluminum if a nickel undercoat is applied first. Standard plating baths are employed.

As with the zinc immersion deposit, almost any of the normal plating procedures may be used for plating over anodic films, the exceptions being baths of high pH value which dissolve the freshly formed aluminum oxide. Copper, nickel, cadmium, brass, and silver may all be plated directly onto the film. Before the deposition of chromium, an undercoat of nickel is necessary.

Plating Racks

Racks for use in plating aluminum should be constructed from commercial purity aluminum or from an alloy similar to that being plated. Because of the low specific gravity of aluminum, positive spring contact should be made with the work; the buoyancy of the metal in the solution will lead to poor electrical contact if this depends on suspension only. Although the appropriate alloy should be used for the gripping parts of the racks, pure aluminum is advisable for all of the main current-carrying members.

Copper wire and copper alloys should never be used on aluminum, as copper may dissolve and contaminate the bath; also electrolytic action will arise between the copper and the work.

Racks may be stripped of most electroplates without harming the aluminum by immersing them in a 50 per cent by volume solution of nitric acid. The oxide film produced on the surface by the stripping solutions may be removed by a light etch in caustic soda or in the zinc immersion solution. Anodic films may be removed by dipping in caustic soda or a phosphoric-chromic acid solution.

Acknowledgment

The writer is indebted to The Aluminum Development Association (Great Britain) for special permission to use data from "Information Bulletin No. 13" in this article.

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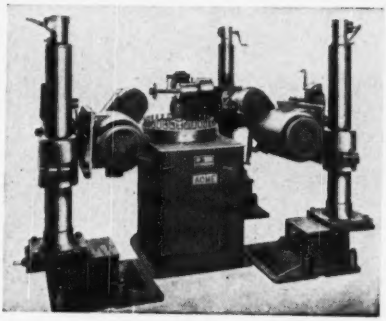

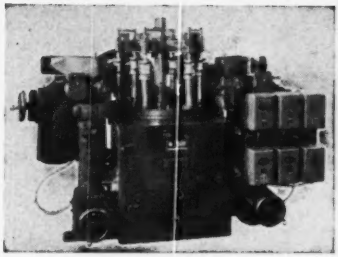

- *Above: Acme Type LC-20 continuous rotary having 20 to 30 continuous revolving spindles which remain idle at unloading and loading stations. This unit has 3 Acme type G-3 adjustable floating head lathes.*
- *Right: 30" Acme Rotary, 6 station indexing machine equipped with 4 adjustable floating head and adjustable tail stock arrangement.*

ACME small indexing and continuous rotaries have demonstrated their efficiency in cutting costs on many types of high production polishing and buffing jobs in many plants.

These machines can be furnished in many standard table sizes and indexing stations depending upon the number of polishing and buffing heads required.

The ACME type G-3 head may be converted to utilize polishing belts with stationary or floating back up wheel.

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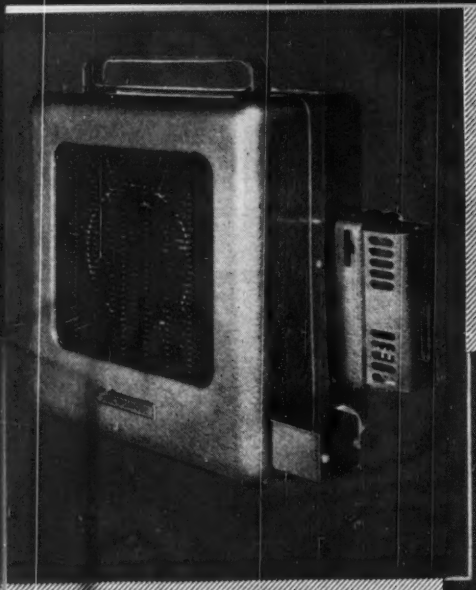
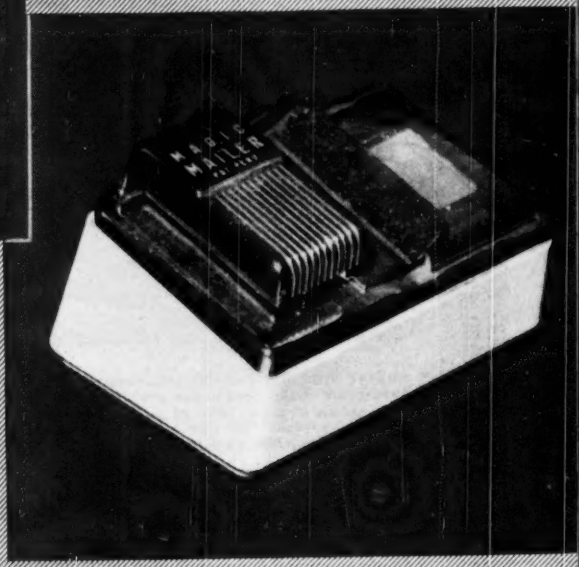


The Electromode All-Electric Mite House Heater is finished in Kem and Ess Grey Hammered Synduc Enamel. The neutral grey blends with any color scheme, and the textured yet smooth surface is easy to clean.

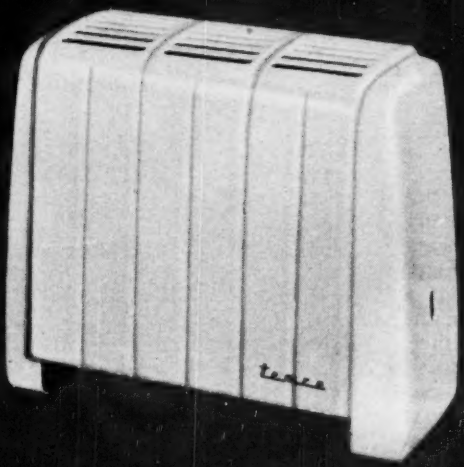
(Photo courtesy Electromode Corp., Rochester 3, N. Y.)



Product of the Haldon Mfg. Co., Inc., Los Angeles, the Magic Mailer is attractively finished with a gray wrinkle enamel on the base and chromium plate on the various sections of the lid. On the spring carriage red lacquer in coined depressions causes the name of the product to stand out and furnishes attractive decoration to the carriage.

(PRODUCTS FINISHING Staff Photo)

that aid in appearance and utility

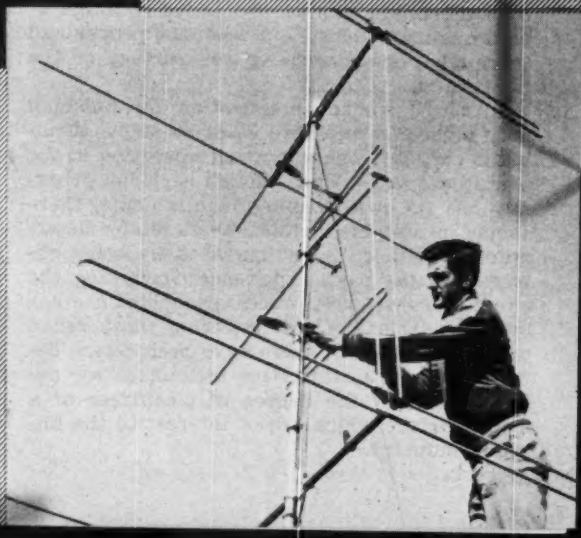


The new line of Tenco Gas Heaters features simplicity and compactness in cabinet styling, and for beauty and durability a porcelain enamel finish available in a variety of shades and colors.

(Photo courtesy Tennessee Enamel Mfg. Co., Nashville 9, Tenn.)

"Perma-tube" Television Antenna, product of The Ward Products Corp., Div. of the Gabriel Co., is manufactured from electric welded tubing and finished with a Vinsynite primer and a vinyl resin base cover coat.

(Photo courtesy Jones & Laughlin Steel Corp., Pittsburgh 30, Pa.)



Spotlighting FINISHING Progress

Recent Developments in Determining Degree of Surface Cleanliness

By DR. ALLEN G. GRAY

THOSE with most experience in the finishing industry realize that too much importance cannot be given to metal cleaning operations. It is generally recognized that the chemical and physical nature of a metallic surface has a marked effect upon the quality of any coating applied to the surface. It is well known that the presence of grease, corrosion products, dirt, and extraneous materials affects the adherence and continuity of coatings whether of metallic or organic nature. Thus, one principle universally recognized is that the production of protective coatings of high quality is dependent upon the proper and thorough pretreatment of the surface of the base metal.

Although surface preparation for finishing may involve several processes or steps, cleaning is certainly one important operation in the overall sequence. Even though each job generally has its own cleaning requirements, there should be suitable methods available for determining whether "clean" surfaces are being obtained. In the past, experience concerning the effect on subsequent processing operations has been probably the one criterion most relied upon. Nevertheless, there have been recent developments in quantitative techniques for determination of the degree of cleaniness of a metal surface which are of interest to the finishing industry.

A Monthly Digest of Current Technical Progress Indicating Significant Trends and Developments in the Finishing Industry

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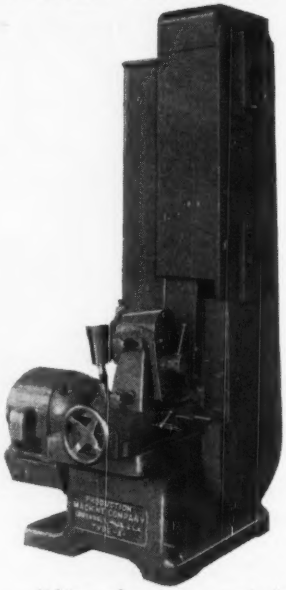

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Radioactive Tracer Technique

Work recently reported from the Monsanto Chemical Company Laboratories has indicated that the radioactive tracer technique can be successfully applied in evaluation of cleaning compositions. According to the technique used by the Monsanto research workers, J. C. Harris, R. E. Kamp, and W. H. Yanko, which was described in a recent ASTM Bulletin, the radioactive tracer technique, as applied to a determination of the efficiency of metal cleaning, appears to be more sensitive than existing methods for estimation of soil removal, is quantitative in character, and appears to be a distinct advance in the art. The availability of radioactive compounds has opened the field for measurement of trace amounts of materials; thus, it would be expected that this technique could offer considerable promise in metal cleaning studies.

According to the Monsanto research workers, since the oil used in laboratory evaluation of metal cleaners is a lubricating oil, it would be preferable that any additive used for indicating soil should be of a similar type. The chemical reactivity or stability of the tracer compound should be of the same order as shown by petroleum hydrocarbons. Also, it was pointed out that the half-life of the radioactive element used should permit a storage period of sufficient length, and the element selected should permit ready synthesis of the desired organic compound. C-14, a soft beta-emitter of very long half-life (5300 yr.) was selected for the tests for these reasons.

It was stated that preliminary evaluation indicated that N, N-di-n-butyl stearamide was soluble in S.A.E. No. 60 oil, and could be synthesized in adequate yield with good purity. In discussing the soiling procedure prior to determination of the efficiency of the metal cleaning operation, the test

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panels used were described as circular, and as having an over-all diameter of 1 inch, this size being restricted to the diameter of the mica window of the Geiger-Müller counter tube. They resembled pans in that they were drawn to a depth of $\frac{1}{16}$ in. with a 1/32 in. rim. At one point in the rim a small hole was drilled to permit vertical suspen-

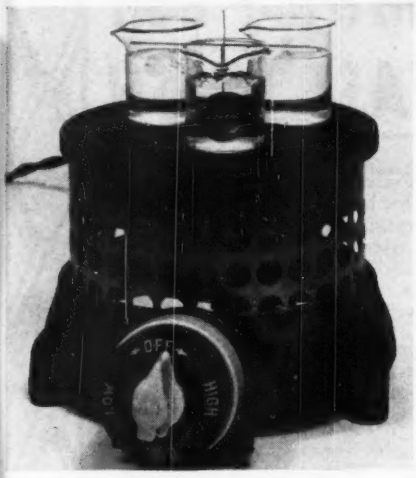


Fig. 1—Cleaner assembly used in radioactive tracer evaluation technique
(Photo courtesy "A.S.T.M. Bulletin")

sion during cleaning or drying. The test pieces were vapor degreased prior to soiling, dried under an infra-red lamp, and stored in a dessicator prior to use. Immediately before soiling each pan was weighed and counted for background.

The stearamide produced for the experiments contained 6.63 microcuries of C-14 per mg. of material. When a thin sample was counted with the Geiger-Müller counter (2.2 mg. per sq. cm. mica window) an activity of 4×10^5 counts per min. per mg. was obtained. It was arbitrarily decided that each test piece should have an initial activity of 10^6 counts per minute, and the experimenters determined by trial that 25 mg. of soil (S.A.E. No. 60 oil plus the substituted radioactive stearamide) would adequately cover the test piece. Thus, on this basis, for the desired test program 99 mg. of oil plus 1 mg. of stearamide would provide enough soil for four test pieces at the desired level of activity.

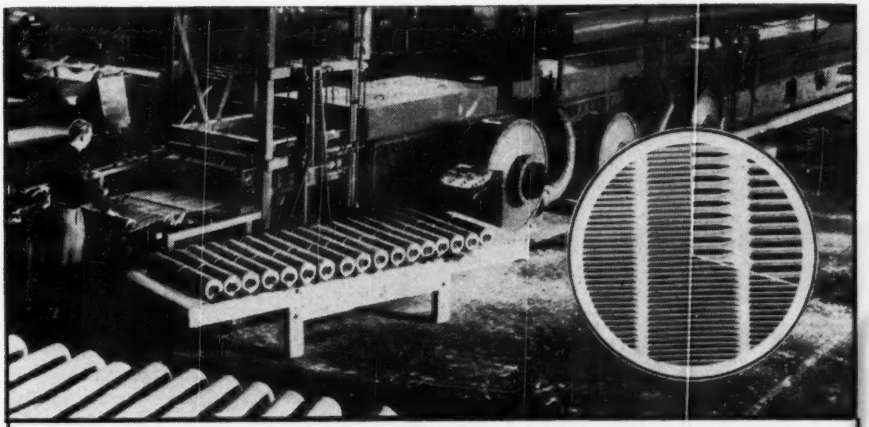
In discussing the technique employed, it was stated that carbon tetrachloride was used as the solvent for the radioactive stearamide; the required volume of solution was added to the oil, and then the carbon tetrachloride was removed by evaporation before application of the soil to the test piece. The active mixture was applied to the test pieces with a thin glass rod about 2 mm. in diameter. Use of a rod of this size, it was pointed out, permitted the rather viscous material to be applied in small increments, and also facilitated an even distribution of the material over the piece. The mixture was well stirred before each application, and added slowly, with weighing, until the 25 mg. was reached.

The detergent solution used in the cleaning experiments consisted of: 5 per cent Santomerse No. 1; 95 per cent anhydrous sodium metasilicate. The concentration used was 5 per cent by weight in distilled water, employing a total volume of 35-40 ml., at the boiling point. A cleaning time of 5 minutes was used. Figure 1 shows the assembly used in the cleaning experiments.

After cleaning, the test specimens were given two rinses in boiling distilled water, and one rinse in running tap water. Six dips were used for each hot rinse, and approximately 60 sec. was allowed for the running tap water rinse. The volume of rinse solutions used was 50 ml. For drying, specimens were suspended under an infra-red lamp until completely dry.

Testing Equipment

The equipment used by experimenters Harris, Kamp, and Yanko consisted of a Geiger-Müller tube with



The Alodizing installation at Permanente's Trentwood, Washington plant. Kaiser Aluminum Shade Screening (shown in inset) excludes insects and, venetian-blind-wise, deflects the rays of the sun thus reducing room temperatures as much as 15° F. without interfering with air circulation.

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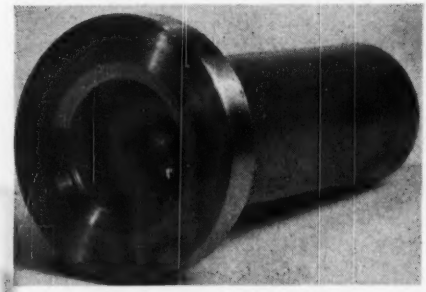

Fig. 2—Geiger-Müller tube used in cleaner evaluation studies
(*Photo courtesy "A.S.T.M. Bulletin"*)

mica window, 2.4 mg. per sq. cm., scaler with scale of 64, timer, and sample holder. Figure 2 shows the Geiger-Müller tube; the testing assembly used is shown in Fig. 3. The sample holder was described as essentially a spring-loaded platform that can be lowered so as to insert the sample, and then raised to place it next to the window.

It was pointed out that using the tracer technique the sensitivity is approximately 2×10^{-9}g. per sq. cm., as compared to the approximate limits of sensitivity attainable gravimetrically of 5×10^{-5} (usual sensitivity is 1×10^{-4} g.). The data given showed that gravimetric methods of estimation of retained soil gave negative results on cleaned test panels. Degreasing methods showed no retained soil, and fluorometric estimation of the plate and of the degreasing liquid gave no indication of retained dye. (2 per cent Fluorescent Green H. W. dye was also incorporated in the oil coating mixture.) Table I shows data indicating that after subtraction of background count, counts still remained at least double to quadruple the background, indicating a so-called "unclean" condition.

However, it was pointed out that with gravimetric methods sensitive to 5×10^{-5}g., and the present method to 2×10^{-9}g. per sq. cm., it is not entirely unexpected that residual soil might be found. Another explanation advanced for the residual count was that chemisorption occurred. Since "soil" remained on the plate, as indicated by radioactivity, experiments were carried out using repeated washing to remove it entirely. Table II indicates that background, or zero, count was attained in from three to five repeated washings, indicating that the preferential adsorption theory would best seem to account for residual radioactivity.

An experiment was conducted to de-

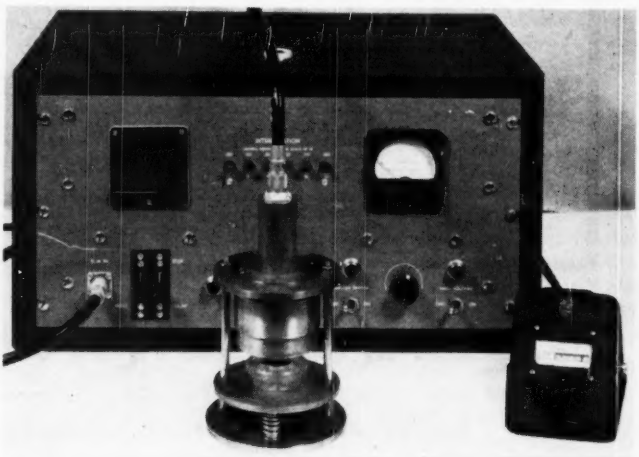

Fig. 3—Scaler, holder, and G-M tube assembly used in application of radioactive tracer technique to metal cleaning studies
(*Photo courtesy "A.S.T.M. Bulletin"*)

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TABLE I
GEIGER-MÜLLER READINGS ON SHEET STEEL—CLEANED; SINGLE WASH

Sample	Initial Count	Count After First Wash*
No. 13	31 800	80
No. 14	31 572	58
No. 15	32 752	102
No. 16	32 331	49

* Subtract 25 for background correction.

termine whether a clean test panel would be contaminated with the radioactive amide present in a used cleaning bath. Following the rinsing cycle, this panel gave a count within the background range which further strengthens the chemisorption theory.

One point brought out was that in using steel panels, it was virtually impossible to prevent some degree of rusting. Experiments were carried out using stainless steel panels, the results of which are given in Table III. It is apparent here that multiple washings also were necessary, but that background count was reached about one wash sooner than with steel. This, again, seems to substantiate the chemisorption explanation for retained activity.

A residual count of 275 after the first wash would be the equivalent of 45 x 10^{-6}g. of total soil, or 0.45 x 10^{-6}g. of radioactive amide, both of which are beyond the sensitivity of the gravimetric method of estimation. Thus, the conclusion drawn by the experimenters from their work was that on this basis, and since the plates are "clean", so far as previously used methods would indicate, the radioactive tracer method of evaluation of cleaner efficiency can be used to advantage, provided that care is taken to use essentially the same amount of initial soil and to control the washing technique. Evaluation of the method indicates that the tracer compound technique can probably be successfully used in evaluation of cleaning compositions, although it was suggested that a hydrocarbon-like tracer compound not liable to chemisorption be used for absolute measurements. Thus, the radioactive tracer technique applied to metal cleaning is more sensitive than existing methods for determination of soil removal, is quantitative in character, and appears to be a distinct advance in methods of testing cleaner efficiency.

Photographing Fluorescent Oil Residues Under Ultraviolet Light

The importance of having an adequate method for evaluating alkaline cleaners for the removal of contaminants from metal surfaces has been recognized by other workers in this field. In discussing the use of synthetic detergents in metal cleaning operations before a 1949 meeting of the Niagara Falls, New York, Section of the Electrochemical Society, Dr. O. M. Morgan, National Aniline Division, Allied Chemical & Dye Corporation, emphasized the importance of proper test methods for determining when a metal surface is clean. According to Dr. Morgan's interpretation, the property of removing oil from a metal surface is recognized easily; however, it is difficult to visualize the quantity and distribution of any small amount

TABLE II
GEIGER-MÜLLER READINGS ON SHEET STEEL—CLEANED; MULTIPLE WASH

Sample	Initial Count	Count After*			
		First Wash	Second Wash	Third Wash	Fourth Wash
No. 13	31 800	80	44	35	27
No. 14	31 572	58	38	28	
No. 15	37 952	102	63	52	42
No. 16	32 331	49	32	32	28

* Subtract 25 for background correction.

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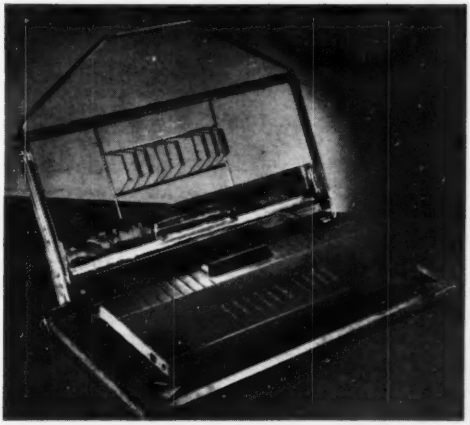

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TABLE III

GEIGER-MÜLLER READINGS ON STAINLESS STEEL—CLEANED; MULTIPLE WASH

Sample	Initial Count	Count After*			
		First Wash	Second Wash	Third Wash	Fourth Wash
No. 21	34 212	212	54	33	27
No. 22	37 707	243	42	25	..
No. 24	38 599	278	60	26	..

* Subtract 25 for background correction.

of oil which may remain after the cleaning. A method of testing cleaning efficiency based on photographing fluorescent oil residues under ultraviolet light has been developed.

It is generally recognized that practically any alkali is capable of removing most of the oil from a metal surface, and unless a quantitative evaluation of the residual oil can be made, the true value of the metal cleaner is left as a matter for conjecture. Developments in the light and more active metals, such as zinc and aluminum, have done a lot to change methods and thinking in modern metal cleaning operations. It was brought out by Dr. Morgan that the measurement of one of several physical characteristics of an alkaline cleaning solution is not sufficient to establish quantitatively its merit as a cleaning agent. A performance test comprising cleaning of uniformly oiled metal samples and observation of the residual traces of oil was found to be most satisfactory.

Testing Method

Mineral oil fluoresces brightly under ultraviolet or "black" light to reflect a visible white. Animal and vegetable oils which do not fluoresce can be made to fluoresce by the addition of an oil soluble fluorescent dyestuff. Since the intensity of the white fluorescence is proportional to the amount of oil present, and since clean metal under ultraviolet light appears black or nearly so, a natural scale of measurement is established. The visible fluorescence is capable of being photographed on an ordinary photographic plate, which provides a permanent record of the extent to which the metal is cleaned. By the use of this method, according to Dr. Morgan, fine distinctions can be made between cleaning compounds.

In order to prepare uniformly oiled metal strips for testing, metal test strips, 2 x 4 inches in size, were scrubbed by hand, thoroughly rinsed in warm water, rinsed in alcohol and allowed to dry. Strips of wool flannel, 1⅞ x 3⅞ inches, were saturated with the oil to be employed in the test. A mineral oil composition such as is used in the rolling of brass has been found very satisfactory. The oil-saturated wool strips were alternated with the metal strips to form a stack, with oil saturated wool strips and protecting metal plates at top and bottom.

The stack of plates was placed between the jaws of a hydraulic press, the edges of the plates having been carefully squared up. A pressure of 500 p.s.i. was applied and maintained until no more oil oozed out, the edges being constantly wiped with a clean cotton cloth. The pressure was then released and the strips removed and retained in a perfectly horizontal position until taken out of the stack, one at a time, for the cleaning tests. By this method of application, the weight of the oil adhering to the surface of the metal did not vary more than three per cent.

Method of Recording Results

After subjection of the metal test plate to the cleaning cycle and composition which it was desired to test,

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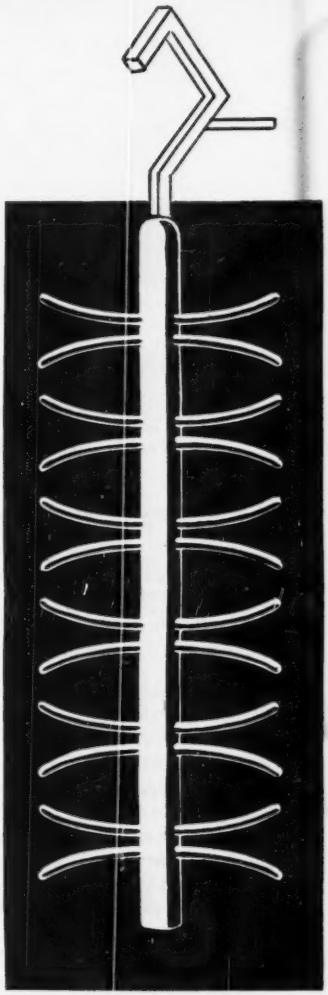

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You get the ideal rack protection in Coating 218X. For (1) It resists abrasion and impact—so Coating 218X is not prone to mechanical damage! (2) It stands up in acids, and hot alkaline solutions, and even *degreasers*—so you can work it through *any* plating cycle! (3) This coating is easy to apply and has unusual adhesion! (4) To cap it all, a United Chromium Service Engineer gives you any technical help you require to do a top quality coating job.

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followed by rinsing and drying, the plates were placed in a rack of such a design that they did not touch each other and kept there until such a time as it was possible to photograph a complete series from a given set of experiments. A diagram of the arrangement of the apparatus described by Dr. Morgan for taking the pictures is shown in Fig. 4.

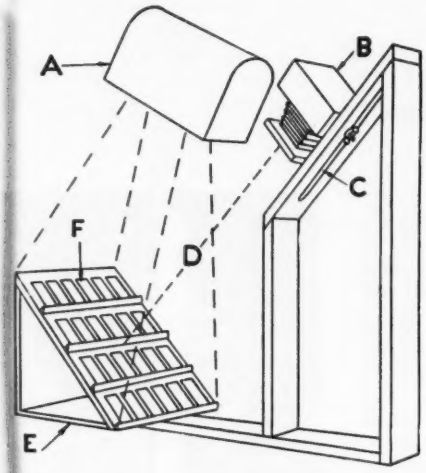


Fig. 4 — Arrangement for photographing test panels used in evaluation of metal cleaner efficiency: (A) ultraviolet lamp, Hanovia Analytic Model Quartz Lamp; (B) 4 x 5 view camera with Wratten K-2 filter and Tri-X film; (C) slot for camera adjustment; (D) distance from camera lens to easel, about 36 inches; (E) easel; (F) metal strips 4 x 2 inches (*Illustration courtesy Electrochemical Society*)

The lamp used provided a powerful source of ultraviolet light, but it was pointed out that any strong source of ultraviolet light that is properly filtered to remove essentially all of the visible spectrum is satisfactory. The ultraviolet radiation was incident to the surface of the panels, at an angle of 45 deg., with the lamp about 30 inches from the mid-point of the rack.

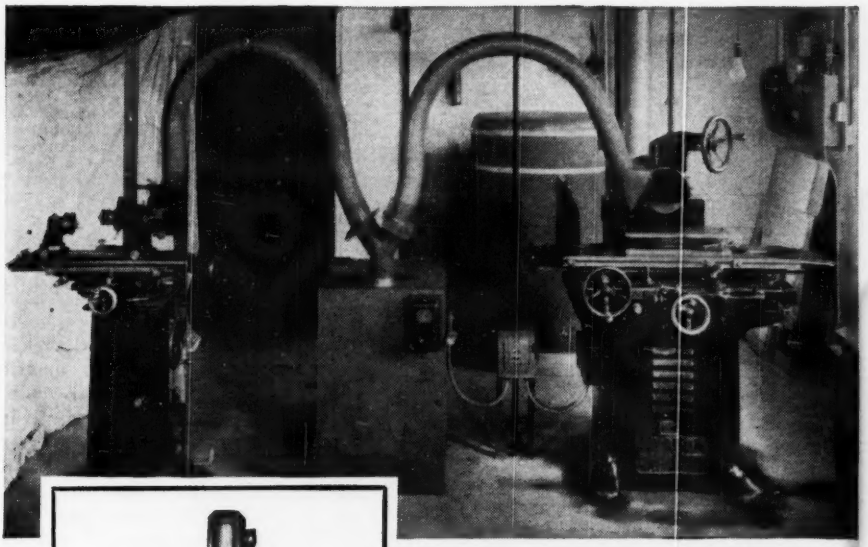
Dr. Morgan presented photographs before the Electrochemical Society Section, which compared the appearances of clean and oiled steel when viewed under ultraviolet light. Under the invisible ultraviolet a clean metal surface appears black, while an oiled surface glows with a brilliant fluorescence. The photographs illustrated the extremities of the visual scale which are established by this test method. This technique may be applied to any base metal wherein it is desired to test the efficiency of the cleaning cycle.

Water-Spray Pattern Method of Evaluation

During the War a method for performance evaluation of metal cleaners was used at Frankford Arsenal, Philadelphia, which consisted of forming a water spray pattern on cleaned panels. In general, this method involved coating of panels by a controlled dipping and drainage technique, followed by a carefully controlled cleaning and rinsing operation. The panels were then subjected to a fine spray of water, which has the effect of sharply delineating the oil-covered regions. Quantitative estimation is made by sketching this pattern on paper divided into squares and counting the number of squares that are free from oil. Figure 5 shows a typical cleaning result pattern. [See also "Ind. Eng. Chem." Anal Ed. 18, 201 (1946)].

In carrying out the test procedure, panels are dipped in oil and allowed to drain at a 45 deg. angle for one hour. It was found that the surface condition of the metal panels had a considerable bearing on cleaning efficiency. In utilizing this test to solve specific plant cleaning problems panels should be selected with surfaces similar to those involved in the problem. Following the application of the cleaning and rinsing cycle that it is desired to evaluate, a fine spray of water is directed at the panel from a distance of approximately 2 feet by means of an atomizer connected to a compressed air line.

The oil-covered regions on the panel are delineated by the condensation



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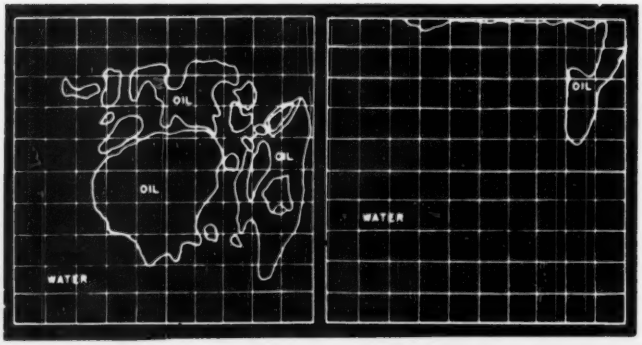

Fig. 5—Typical cleaning results on test panels using the water spray test method: (left) cleaning index 73 (fair); (right) cleaning index 94 (good) (*Illustration courtesy "Industrial & Engineering Chemistry"*)

upon them of fine droplets of water, resulting in a pattern which remains constant for at least 20 minutes. These are sketched on paper ruled into 100 squares. The number of squares covered with water (no droplets condensed) is counted for each side of the panel. Based on the scheme carried out in the Arsenal tests, the results obtained with five panels, resulting in 10 observations, are averaged and this is called the cleaning index.

Water-Break Followed by Plating Test

Certain tests can be made in the laboratory to screen out poorly designed alkali cleaners. It is generally best to make cleaning tests first by soak cleaning, then cathodic cleaning, and finally anodic cleaning. If test panels are to be used, they should be given a uniform surface and then coated with an oil (engine oil has been used satisfactorily). In testing cleaners under electrolytic conditions, a current density of 10 amp./sq. ft. is preferred because differences in alkali cleaners will show up greater at low current densities, and low current density areas are the hardest to clean.

The water-break method should not be the sole criterion for determining whether perfect cleaning has been done. One supplementary test that has been used is to plate the panel with bright nickel. After the panel has been cleaned to no apparent water-break, it is immersed in a 10 per cent sulfuric acid pickle for a few seconds, and then bright nickel plated. As a general rule, if there is unremoved solid dirt, or if oil is not completely removed, a poor quality plate will result. Solid dirt will be evidenced as a haze under the plate, and oil residues will cause poor adhesion, which will be brought out by bending the plate. For true evaluation, it is good practice to electrolyze the cleaners hot for several days and make cleaning tests periodically to see if there is any decomposition of the cleaner. In certain cases, decomposition may be evidenced by poor detergency; in others, it may be brought out by the formation of an insoluble residue on the work that may be particularly noticeable after bright nickel plating.

Although the water-break method has been used for a long time as a criterion for evaluating metal surface cleanliness, it has been subject to criticism. The test is based on the ability of metal surfaces to sustain an unbroken film of water when "chemically" clean. One group of experimenters has pointed out that this test is inadequate since the water-break pattern is dependent on the thickness of the water film. Thus, smaller and smaller areas sustaining a complete water film are obtained as the water drains from the panel. Also, as these areas begin to reach a more or less steady state, evap-

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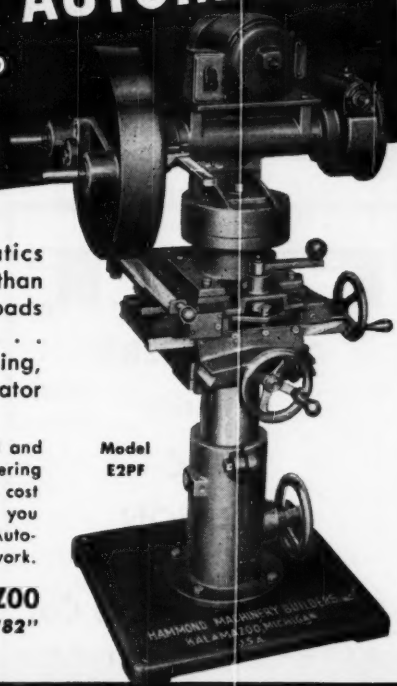

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oration of the water may become a factor in obscuring the results. It is possible that these factors may interfere with an accurate estimate of the efficiency of metal cleaners.

Principles of Detergency

Detergency or the ability to clean or remove organic and inorganic dirt from the surface of metal products results from many factors. The most important factor in detergency is low interfacial tension between the cleaning solution and the metal being cleaned. This low interfacial tension enables the cleaning solution to loosen and undermine the dirt, as well as break it up into globules that can be lifted away from the metal surface in the cleaning process. Many other factors play a part in the efficiency of the metal cleaning process; some of these are deflocculation, saponification, and emulsification, but metal cleaning specialists generally consider the ability to displace dirt as the most important factor in cleaning operations. With the development of scientific methods for determining "how clean is clean," a better understanding will be had of the factors promoting efficiency in production line cleaning operations.

* * *

Future Prospects in Paint and Varnish Manufacture

SOME of the future prospects in store for paint and varnish manufacturers were recently brought out as a part of a staff-industry collaborative report prepared by W. H. Shearon, Jr. of "Industrial and Engineering Chemistry" in cooperation with R. L. Liston and W. G. Duhig of Cook Paint and Varnish Company, Houston, Texas. Among the improvements that have been noteworthy in the past few years is that of pigments; the classical pigments show higher color purity and uniformity, white pigments are more durable and opaque, and there is a host of new organic and metallic pigments, some having anticorrosive, antibiotic, and luminescent properties.

Likewise, according to the report, new drying oils from esterification of linseed fatty acid with such polyhydric alcohols as sorbitol and polypentaerythritol have shown considerable promise; also, the use of milkweed seed oil has been suggested. Petroleum resins, drying oils, solvents, and thinners are taking more and more prominence in the industry. It was shown that where turpentine once dominated the thinner market, it amounts to only about 20 per cent now; others are alcohols, ketones, esters, and aromatic hydrocarbons most of which are made from petroleum products.

The report brought out the important fact that the new light-colored hydrocarbon drying oils, predominately cyclic in structure, and with iodine

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numbers of 180 to 250, indicating three to five double bonds per molecule, constitute a great improvement over the black or dark-colored petroleum drying oils heretofore available, and have made possible an expanded field of utility in light colored finishes. They are generally less expensive than linseed oil or the cheapest vegetable or animal oils. A number of petroleum resins have shown considerable promise in air-drying and baking varnish formulations. It was pointed out that although petroleum-derived products have their limitations, good quality products can be manufactured, economically, by use of the hydrocarbon oils in conjunction with linseed and other drying oils.

Progress is being made in supplying temperature resistant paints. Work done by the Houston Paint and Varnish Production Club on a formula to resist temperatures up to 800 deg. F., and to withstand exterior exposure has indicated that a paint based on an organo-silicon oxide polymer vehicle and pigmented with any of the commonly used metallic pigments and/or zinc oxide will approach these requirements. Also cited in the report was work being done on the use of silicates for high temperatures, and progress made by the Australians on development of a butyl titanate pigment which looks promising for such applications.

The new vinyls, although they may be somewhat hard to handle, are gaining an excellent reputation in the paint industry, it was pointed out. It has been predicted that future emergencies may cause standardization of alkyds which will encourage continuous processes, and a greater tendency toward larger size kettles; oil-modified alkyds will probably continue to increase in volume. There will probably be an increasing tendency on the part of finish manufacturers to make their own alkyds.

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Another trend in the manufacture of modern industrial finishes is the application of proper testing procedures to the selection of raw materials. When paints are made to rigid and reproducible specifications, as are many industrial finishes and formulas covered by government specifications, testing of raw materials becomes especially important. In general, many of the color pigments which are manufactured batchwise require complete tests as there may be considerable variation between batches. Other raw materials, after proper selection, may not require continued elaborate testing. In discussing the tests made at the Cook Paint and Varnish plant, it was stated that pigment tests used were for strength, cleanliness, tone, and so on. Oils are tested principally for water content and gelation properties; tung oil particularly is tested, as most of it is received from China and its composition is sometimes not reliable.

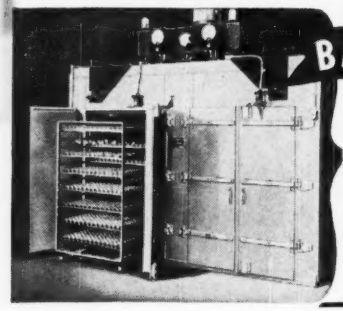
Laboratory tests on finished paints and varnishes usually involve determination of application characteristics, such as spraying, brushing, dipping, drying time, texture, viscosity, weight per gallon, and such surface characteristics as gloss and reflectance. In some finishes, other tests such as water resistance, flexibility, wear resistance, and adhesion are important. These tests all contribute to the overall goal of the present-day industrial finish manufacturer—the production of the best type of surface coating for a particular purpose.

* * *

Plated Products from the Consumer's Viewpoint

WHAT does a customer look for in a plated article? Actually, what he usually wants to see is his own image in a flawless mirror surface, and he wants that surface to last for a lifetime. This was the viewpoint presented by Thor H. Westby and Robert E. Parkinson, Merchandise Testing and Development Laboratories, Sears Roebuck and Company, before the symposium on the business of plating at the opening session of the 36th Annual Electroplaters' Society Convention, held in Milwaukee. It was pointed out that appearance and durability of that appearance are the principal factors for the selection of plating in competition with other coatings or finishes. There are, however, many functional applications of plating where plating is chosen because of its durability in the sense of actual protection of the article from destruction or where other properties of metallic coatings are important, such as ductility, conductivity, and wear resistance.

Sears Roebuck and Company Laboratories depend on the A.S.T.M. standards for test procedures and use



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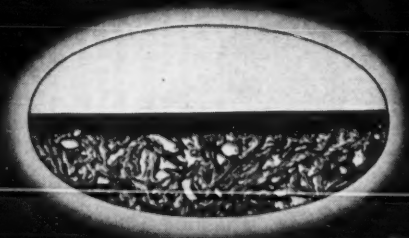

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them as bases for specifications. However, Westby and Parkinson emphasized the importance of cooperation between platers and customers to establish uniform standards of quality, and to supplement laboratory methods of test, such as plating thickness measurements and salt spray tests, with actual field service experience.

In discussing automobile accessories, Westby and Parkinson stated that they have set up specifications in terms of plating thickness and salt spray corrosion resistance, taking into account the position where the accessory is to be exposed; on the exterior at bumper level where exposure is very severe; on the exterior at the body level where exposure is less severe; and on the interior of the car where exposure is mild. In addition, a system of grade labeling has been instituted so that the consumer can judge what service he can expect from the plate on the article.

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For severe exterior corrosion the best quality is called "Lifeware Plate", which on steel must meet the specifications of 0.00125 inch nickel plus 0.00001 inch chromium and must withstand a 100 hour salt spray test. For moderate service requirements an intermediate quality plate called "Triple Plate" is required. This must meet specifications of 0.00075 inch of nickel plus 0.0000075 inch of chromium. This plated product must withstand 75 hours in the salt spray. For mild service, the minimum requirement is 0.0004 inch of nickel plus 0.000005 inch of chromium; this plate is required to pass a 24 hour salt spray test. It was pointed out that on brass, the specifications for salt spray and chromium thickness are the same, but the nickel thicknesses required are 0.0006 inch, 0.0004 inch, and 0.0002 inch for the three grades respectively.

Specifications for electrodeposited coatings on copper alloys for plumbing which were given by Westby and Parkinson are outlined below:

Nickel Thickness	Salt Spray
Extremely severe service	
0.0005 inch min.	150 hr.
Severe service	
0.0003 inch min.	100 hr.
General service	
0.0002 inch min.	75 hr.
Mild service	
0.0001 inch min.	50 hr.

In all cases, 0.0000010 inch of chromium is required. In the case of these products it was stated that plating thickness is considered more important than salt spray, since failures are due more to abrasive wear than to corrosion.

* * *

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PENN SALT
metal cleaning compounds

only required source of organic matter by reaction of glycerol apha-allyl ether with phthalic or succinic acids under conditions to form polyesters. Based on data presented by H. Dannenberg, T. F. Bradley, and T. W. Evans of Shell Development Company in a paper before the Division of Paint, Varnish, and Plastics Chemistry at the 113th Meeting of the American Chemical Society, Chicago, surface coatings made from the polyesters have outstanding properties in applications where elevated temperature can be used for forced drying or baking of the films. Conversion at room temperature is possible but relatively slow.

The properties of the coatings can be varied within wide limits by the choice of dibasic acid. According to the report by the Shell research workers, toughness and high chemical resistance are introduced by phthalic anhydride; hardness and abrasion resistance by succinic acid; softness and flexibility by adipic acid or alkenylsuccinic acids. It is also possible to incorporate drying fatty acids into glycerol alpha-allyl ether esters or to modify conventional alkyd resins by replacing part of the glycerol by glycerol alpha-allyl ether. Drying times and baking schedules vary with the nature of the polyesters as well as with the amount and composition of the drier. Coatings on a variety of different metals have been produced with satisfactory adherence.

Weather resistance comparison tests were carried out with glycerol alpha-allyl ether phthalate and succinate. The life in a twin-arc Weatherometer was 1500 hours or more. In outdoor exposure tests conducted at Oakland, California, it was reported that the glycerol alpha-allyl ether derivatives as well as the alkyd were still in excellent condition after 6 months. The derivative finishes were also reported to be practically immune to common solvents and only temporarily softened by boiling water. A white baking enamel based on glycerol alpha-ether phthalate showed superior heat aging stability when compared to a high grade, commercially available white baking enamel (urea-formaldehyde soybean oil alkyd type).

With reference to physical properties of the new finishes it was reported that the glycerol alpha-allyl ether phthalate showed unusual hardness. When compared with the alkyd resin, the abrasion resistance of the succinate was about 8 times as high, the falling-sand hardness 2.5 times, the scratch hardness 1.6 times as high, and the rocker hardness the same. These tests indicate that the hardness of the coating is elastic; it yields to deformation but is resistant to surface injury. The phthalate derivative showed better hardness that the alkyd resin, along with good flexibility and toughness.

Buhl Optical Inspection Instruments. Illustrated data sheets describing the Buhl S-129 Pocket Microscope (40 to 60 power), S-152 Handi-Scope (20 power), and the S-42 Magniprox Desk Magnifier, together with specifications, prices, and operating information, are available from the Buhl Optical Co., Desk T-166, 1009 Beech Ave., Pittsburgh 12, Pennsylvania.

Stonhard Stoncote, an acid-resistant coating for floors, walls, machinery, and so on, is discussed in a folder issued by the Stonhard Co., 500 Stonhard Bldg., Dept. PF, 1306 Spring Garden St., Philadelphia 23, Pa. Properties, uses, and results are described.

"How Canadair Uses Liquid Envelope," a 24-page book prepared by Better Finishes and Coatings, Inc., 268 Doremus Ave., Newark 5, N. J., is essentially a picture record of the many metal fabricating and assembly operations in the Canadair plant where "Liquid Envelope," a peelable, protective plastic coating, cuts scrap losses and improves product quality.

Du-Lite is the "tried and true" method for black oxidizing all parts of steel except stainless. Du-Lite is used for its attractive, rust-resistant finish on many parts for typewriters, business machines, fire arms, cameras, binoculars, razor blade holders, filters, aircraft engines, spark plugs, and many others. If this listing suggests that Du-Lite could advantageously be used on your product, do not hesitate to call for one of our qualified, technical field men. They are located within easy distance of all industrial centers.

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100 RIVER ROAD — MIDDLETOWN, CONNECTICUT

DO IT RIGHT WITH DU-LITE

NEWS of the Industry

COMPANIES

Graduate and undergraduate students in U. S. A. and Canadian Ceramic and Ceramic Engineering Schools have been invited to enter a Thousand Dollar Award Contest being sponsored by the Central Research Division of **FERRO ENAMEL CORPORATION**, Cleveland, Ohio.

Dr. G. H. McIntyre

The company will award five prizes for the best papers written by students on any phase of technology related to porcelain enameling of metal. The first award will be for $500.00; the second for $300.00; the third, $100.00, and fourth and fifth, $50.00 each.

The contest will close at midnight on March 15, 1950, and prizes will be announced at the 52nd Annual Meeting of the American Ceramic Society which will be held in New York, N. Y., on April 24, 1950.

Judges are Charles S. Pearce, Secretary, The American Ceramic Society, Edward Mackasek, Porcelain Enamel Institute, and Dr. G. H. McIntyre, Ferro Enamel Corporation.

Dr. McIntyre has announced that his company is sponsoring the contest to stimulate the interest of university students in the science and technology of porcelain enameling of metals. The company he represents maintains several laboratories devoted to the study of basic porcelain enamel ingredients; supports a university-supervised program for the development of new products related to porcelain enamel; and also maintains a design-staff for the advancement of equipment suitable for the process.

Rules governing the contest are available from the Ferro Enamel Corporation, or from any Ceramic or Ceramic Engineering School.

Papers submitted for consideration should be sent to Dr. G. H. McIntyre, vice-president and director of research, Ferro Enamel Corporation, 4150 East 56th Street, Cleveland 5, Ohio.

THE MINNESOTA MINING & MANUFACTURING CO., St. Paul 6, Minn., is now occupying two new combination branch office and warehouse units, one in Grand Rapids, Michigan, and the other in Ridgefield, New Jersey, which will serve the entire New York area and eliminate the present branch at 155 Avenue of the Americas, New York City.

Served by a rail siding and complete truck loading facilities, the Grand Rapids building contains approximately 10,000 square feet of floor space, and the Ridgefield branch, 53,500 square feet.

REXTON FINISHES, INCORPORATED, 62 Woolsey St., Irvington 11, N. J., has been formed to produce specialized technical coatings.

Heading the company will be Albert A. Miesem, who will have associated with him S. A. Metrick, W. H. Stephens, R. V. Kirk, R. K. Hungerford, Paul Andersen, G. F. Caskey, W. G. Mengel, and P. J. Thouluc, all of whom have had extensive experience in the lacquer and synthetic finish business.

Another Customers' Products Exhibit and Open House is announced by **MAAS & WALDSTEIN CO.**, Newark, New Jersey, manufacturer of lacquers and synthetic enamels.

The exhibit, which began on October 17, is to continue for one month. Considerable space has been provided in the company's main offices at 438 Riverside Avenue, Newark, New Jersey, where the exhibit is being held from 3 p.m. to 5 p.m., and 7 p.m. to 9 p.m. daily except Saturday and Sunday.

Numerous articles that have been manufactured in the production line and finished with M & W lacquer and synthetic enamels show the extremely wide variety of products being used by manufacturers today on practically everything from diaper pins to caskets.

Regular guided tours are being made by a staff of attendants and the prerequisites for organic coatings to be used on those products displayed are being thoroughly discussed.

Maas & Waldstein Co. cordially welcomes those who wish to attend and requests that letters be sent to the company at 438 Riverside Avenue, Newark 4, New Jersey, for invitations.

John F. McCann and VeDell E. Guernsey have assumed ownership of the Superior Plating and Polishing Works, 77 Hickory Street, Johnstown, Pennsylvania. The business will be continued as the **JOHNSTOWN PLATING COMPANY.** Complete facilities are available for plating industrial and decorative chrome, nickel, zinc, silver, cadmium, and copper. Mr. McCann and Mr. Guernsey were formerly associated with the Electrochemical Department of the Western Electric Company, Baltimore, Maryland, as electro-chemical development engineers. In addition to electroplating, both men have had considerable experience in the electropolishing and electroforming fields.

Creation of an associated company, **AFFILIATED FURNACE & ENGINEERING INC.**, has been announced by Charles E. Stone, president of Chemsteel Construction Co., Inc. The company will specialize in design, construction, and maintenance of industrial furnaces, and offices will be maintained at 5428 Walnut Street, Pittsburgh, Pennsylvania, with Chemsteel.

Officers are: Arthur M. Krieger, president and general manager; Clarence B. Avery, vice president, engineering; Merrill A. Stewart, vice president, construction; and Charles E. Stone, secretary-treasurer.

Charles E. Stone, Arthur M. Krieger

Chlorinated rubber, nitrocellulose, and new and improved synthetic resins—bases for protective coatings of top quality performance—were some of the products included in **HERCULES POWDER COMPANY'S** exhibit at the Paint Industries Show held in Atlantic City, November 2-5.

The exhibit exemplified the wide variety of chemicals for the paint, varnish, and lacquer industries which have been developed in Hercules research laboratories.

Typical of the chemicals on display were "Parlon", Hercules chlorinated rubber, which is receiving considerable attention from the paint industry. Chlorinated rubber-based paints can be formulated to have outstanding resistance to acids, alkalies, and other agents which commonly destroy surfaces treated with conventional paints. The chlorinated rubber-based paints can be applied to metal or concrete surfaces and are available in a wide range of colors.

Besides refinements in rosin itself and the development of terpene chemicals, Hercules also produces a wide variety of synthetic resins based primarily on rosin and other basic raw materials.

Included among the synthetic resins were representatives of the "Cellolyns" and the "Pentalyns." Newest addition to the "Cellolyn" family is "Cellolyn" 502, which is finding wide application in the manufacture of superior high-baking

white finishes. These finishes are used on refrigerators, washing machines, stoves, and similar items.

The "Pentalyn" Resins, which were on display, are another example of resins designed for a special objective. These pentaerythritol esters of rosin make it possible for varnish makers to by-pass current tung oil shortages.

REICHHOLD CHEMICALS, INC., Detroit, Mich., and the **DIAMOND ALKALI CO.**, Cleveland, Ohio, have announced a cooperative venture for the further development of Reichhold's phenol operation in Tuscaloosa, Alabama. Under the plan, it is contemplated that the physical assets and operation of the Tuscaloosa plant will be transferred to a new Alabama corporation. P. J. Ryan, who is the Reichhold vice president and general manager at Tuscaloosa, will continue to direct the operation of that plant.

COMMERCIAL FILTERS CORP., Boston 27, Mass., manufacturer of Fulflo Filters and Cartridges for the microscopic filtration of all industrial and commercial fluids, has opened a Midwestern sales office at 603 West Washington Boulevard, Chicago. The new office will be in charge of Walter H. Magee.

NEW POSITIONS

Appointment of **E. H. EHLERT** as region manager of industrial cleaning equipment and chemical sales for midwestern states has been announced by L. Camel, sales manager of the industrial division of Detrex Corporation, Detroit 32, Michigan.

Mr Ehlert, whose headquarters will be in Chicago, studied mechanical engineering at Case School of Applied Science and was in business for himself for ten years before he joined the field sales and service staff of Detrex in 1943. Here he obtained wide experience in the solution of industrial processing problems involving both solvent-vapor degreasing and alkali cleaning.

In 1948 he was made manager of the Detroit industrial sales office, in which capacity he correlated sales with engineering work on all large cleaning and processing equipment designs and installations.

W. J. MILLER, who also joined Detrex early in 1943, has been placed in charge of the field application of Detrex alkali and emulsion cleaning compounds and coating materials for the Midwestern states. He has had broad experience in the sale and servicing of all types of industrial cleaning chemicals and equipment.

Burke B. Roche, president, Binks Manufacturing Company, has announced the appointment of **E. J. CREMER** as manager of the new Binks sales and engineering office, located in Suite 4202, Empire State Building, 350 Fifth Ave., New York 1, N. Y. This office will serve as principal headquarters on the Atlantic Seaboard.

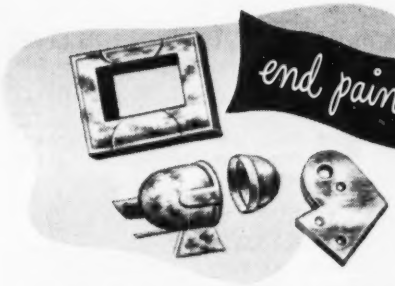
E. J. Cremer

Mr. Cremer is an industrial engineer with an excellent background in the field, gained through his work in the Binks engineering department and industrial sales division.

G. J. Berry, vice president and sales manager of The Electric Products Co., Cleveland, Ohio, has announced the appointment of **E. G. SCHROEDER** to the position of field sales manager. In his new position Mr. Schroeder will supervise all district sales activities.

Joining The Electric Products Company in October, 1945 as head of the Detroit district office, Mr. Schroeder formerly was associated with the New York State Electric and Gas Corporation and the General Electric Company.

American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y., has announced the appointment of **DR. L. P. MOORE** as manager of its New Products Development Department. The firm has also announced the appointment of **DR. E. W. COOK** as its European technical representative.



end paint failures on die castings

BONDERITE

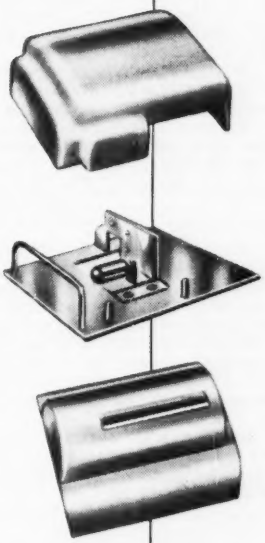
FAST • DEPENDABLE ECONOMICAL

Die castings and paint need something *between* them to keep *them* together!

Bonderite creates a layer of nonmetallic crystals on die-cast surfaces; a layer that is part of the metal itself. Bonderite resists under film corrosion, provides a perfect anchor for paint, ends peeling and lifting of the organic finish. Bonderite-treated die castings hold their factory-created fine appearance.

Bonderite treatment prior to painting is simple and uniform in performance, effective in results, economical in cost, and fast enough to match any production line's pace.

Bonderite *your* die castings before you paint.



OUR TECHNICAL BULLETIN TELLS THE STORY

Get full information on Bonderite for die castings. Write today for *Free* technical bulletin.

Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.

Parker

PARKER RUST PROOF COMPANY
2172 East Milwaukee Ave.
Detroit 11, Michigan

BONDERITE—Corrosion Resistant Paint Base • PARCO COMPOUND—Rust Resistant
PARCO LUBRITE—Wear Resistant for Friction Surfaces

Through L. H. Miller, manager of the Liquid Plastics Division, the Ferro Enamel Corp., Cleveland, Ohio, has announced the appointment of representatives in Ohio and Illinois.

O. P. Taylor, G. J. O'Roark

O. P. TAYLOR will handle the sale of Vedoc organic industrial finishes in the northern Ohio territory, with headquarters at Clyde, Ohio.

G. J. O'ROARK will act in a similar capacity in the Chicago territory. His headquarters will be in the Chicago district offices of Ferro Enamel Corporation, parent firm of Liquid Plastics Division, located at 336 North Central Avenue.

According to an announcement, **VERNE VERZIER** has joined The Roberts Rouge Co., Stratford, Conn. Recognized as one of the outstanding authorities on glue chemistry and abrasives, he is a graduate of RPI, a licensed professional engineer, and a member of the Electrochemical Society, American Chemical Society, and the American Electroplaters' Society.

Mr. Verzier was formerly associated with the Lea Manufacturing Company and the Lupomatic Tumbling Barrel Company.

E. S. Nickerson, general manager of the Fabrics and Finishes Department of the Du Pont Company, has announced the appointment of **DR. GEORGE D. GRAVES** as director of the department's chemical division. He succeeds John Marshall, who died on August 27. The two assistant directors are **DR. J. DORMAN McBURNEY** and **JAMES B. BULLITT, JR.**, former director of the Philadelphia laboratory.

Dr. Graves has been associated with the Du Pont Company for more than 22 years, and since 1945 has been assistant director of the chemical division of the Plastics Department.

Leo Sklarz, sales manager, Pigment Department, American Cyanamid Company, Calco Chemical Division, has announced the appointment of **ELMER CARLING** as an assistant sales manager.

Mr. Carling who was, prior to his new appointment, Eastern regional sales manager will be located at the main office of the Pigment Department at Bound Brook, N. J.

Announcement was also made of the appointment of **CLIFFORD D. SIVERD**, assistant eastern regional manager, to succeed Mr. Carling as eastern regional sales manager with offices at 48 West 38th Street.

JOHN DIETZE, a graduate industrial engineer who joined Calco in 1947, has been appointed sales representative in the metropolitan territory.

WALTER PASCOE, a recent graduate of Penn State College, has accepted a position in the Research Laboratory at The Atlas Mineral Products Company, Mertztown, Pennsylvania.

John E. Morrison

Link-Belt Company, Minneapolis plant, announces the opening of a district sales office in Duluth, Minnesota, with headquarters at 422 Board of Trade Building, 301 West First Street, Duluth (2).

JOHN E. MORRISON, formerly district sales engineer at Chicago and Minneapolis, has been appointed district manager in charge of the new office. He will be assisted by **HAROLD A. IVARSON**, who has been transferred from the Link-Belt plant in Minneapolis, where he handled the city desk and called on customers locally.

No Alibi •

Alibis are not needed for BUNATOL No. 1000 Paste rack insulation. It does a real job and excuses are not necessary. Actual results out in the shop tell the story.

You should get the facts about No. 1000 Paste. It's low in price and easy and simple to use. In labor, time and cost, rack insulation is simplified. The only unusual point is that an oven is required to bake the insulation.

Very long insulation life is another factor. One of the very large shops where they use BUNATOL advises us that frequently racks wear out before the insulation. In every case No. 1000 long outwears any of the ordinary kind.

No. 1000 Paste is 100% solids plastisol. There is no evaporation loss. The insulation is thick and very tough, and not only withstands all plating solutions but rinses freely and does not drag out.

Regardless of what insulation you are now using investigate BUNATOL. Send us a rack and we will insulate it without charge so you can run an actual shop test. Do this now.

Nelson J. Quinn Company, Toledo 7, Ohio

The following promotions in management of the Minnesota Mining & Manufacturing Co., St. Paul 6, Minn., have been announced:

Richard P. Carlton, William L. McKnight

WILLIAM L. McKNIGHT, president of the firm since 1929, has been elected to the newly created post of chairman of the board. His successor to the presidency is **RICHARD P. CARLTON,** former executive vice president in charge of research, engineering, and manufacturing.

ARCHIBALD G. BUSH, former executive vice president and director of marketing and distribution, has become chairman of the executive committee.

Also named were two new executive vice presidents, **GEORGE H. HALPIN** and **HERBERT P. BUETOW.** Mr. Halpin, former vice president of sales, will continue to direct sales activities, and Mr. Buetow, treasurer since 1939, becomes executive vice president in charge of finance.

IRA ROSIN, of 3751 Prospect Avenue, Cleveland 15, Ohio has been appointed sales representative in the Cleveland territory for The Barnstead Still & Sterilizer Company of Boston, Massachusetts.

T. M. Bohen, president of Whitehead Metal Products Company, Inc., a subsidiary of International Nickel Company, Inc., has announced that **CLAYTON D. GROVER,** vice president, has been elected a director of the company.

Associated with International Nickel since 1925 and with Whitehead since 1927, Mr. Grover is the author of several technical publications and is a member of the American Chemical Society, American Society for Metals, American Association for Advancement of Science, and National Sales Executives Club.

George L. Wirtz, president of the Atlas Products Company, Mertztown, Pennsylvania, has announced that **A. MYLES YOUNGER** has been elected vice president in charge of sales. Mr. Younger joined the firm as a chemical engineer in 1939 and in the interim has held positions as Midwest sales manager, plant manager of the California plant, general manager of the Texas Division, and general sales manager.

E. W. ALLISON has been elected secretary-treasurer of Detrex Corporation, Detroit 32, Michigan, manufacturer of industrial and dry-cleaning equipment and chemicals, according to an announcement by A. O. Thalacker, vice-president and general manager.

E. W. Allison

Mr. Allison, who has been with the company since 1941, has progressively advanced through the Legal Department, and the positions of assistant secretary and secretary of the company. In addition to taking charge of the financial operations of the company, including the accounting and credit departments, he retains his duties as secretary with supervision over the legal and personnel departments.

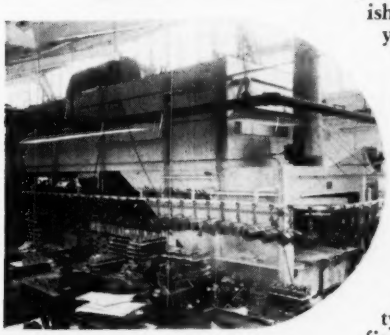
Prior to joining Detrex, Mr. Allison graduated from the University of Michigan Law School, from which he holds A.B. and J.D. degrees, and spent six years with a Detroit law firm.

G. E. POWERS, whom he succeeds, has retired after 25 years with the company.

MORE ECONOMICAL

To INSTALL
To OPERATE

YOUNG & BERTKE
INDUSTRIAL OVENS
FINISHING SYSTEMS
SPRAY BOOTHS



Young and Bertke Industrial Ovens and Finishing Systems are carefully planned to give you the most for your money. Each installation is considered as an individual problem and is designed to give you the best and most economical method of installation and higher production at lower operating cost.

You can be sure that Young & Bertke Ovens and Finishing Systems are efficient and economical. So no matter what your oven and finishing problems are—baking, japanning, lacquering, enameling, drying, etc., for rack, conveyor, vertical, horizontal or tunnel types—there is a Young & Bertke oven to fit your exact needs. We feature Burdett "Infra-Red Principal" gas-burning installations for ovens. Write us today.

The YOUNG BERTKE Co.

1124 BUCK STREET CINCINNATI 14, OHIO

Joseph Hager (left) vice president, and Howard Lawrence (right), president of the Grand Rapids Varnish Corporation, are shown presenting Everett Bryant (center) with a sterling silver tea and coffee service in recognition of 25 years' service with the corporation.

To Mr. Powers goes credit for the sound financial condition of the company which has grown to a business that is international in scope, having patents in 17 foreign countries. Mr. Powers will act as consultant on financial matters and will remain on the board of directors.

HONORS

Highlight of the Grand Rapids Varnish Corporation's annual sales convention, held in Grand Rapids, Michigan, September 27 and 28, was the presentation of awards to salesmen with outstanding service records. **EVERETT BRYANT,** High Point territory salesman, was presented with a sterling silver tea and coffee service commemorating 25 years with the corporation.

Other salesmen especially honored were **HAROLD WORTH,** Grand Rapids representative with 30 years' service, and **ROY COOK,** Pennsylvania salesman with 31 years' service. Special service award plaques were presented to others with over 5 years' association with the company.

MEETINGS

The **PHILADELPHIA BRANCH** of the **AMERICAN ELECTROPLATERS' SOCIETY** will hold its Annual Educational Session and Banquet at the Broadwood Hotel, Broad & Wood Sts., Philadelphia, on Saturday, November 19, 1949.

The educational session will begin at 1:30 p.m. and the speakers will be: Dr. William Blum, Chief, Electrodeposition Section, National Bureau of Standards, Washington, "New Directions for Research in Electrodeposition"; Alfred Douty, Chief Chemist, American Chemical Paint Co., Ambler, Pa., "Pickling, Inhibitors, and Embrittlement"; and Henry Mahlstedt, Sales Manager, Electrodeposition Division, United Chromium, Inc., New York, "Chromium Plating."

The banquet will he held at 7:00 p.m., followed by entertainment and dancing later in the evening.

The **DETROIT BRANCH** of the **AMERICAN ELECTROPLATERS' SOCIETY** will hold its Annual Educational Session and Dinner-Dance on December 3, 1949, at the Hotel Statler, Detroit. Arthur W. Logozzo, national president of the A.E.S., is chairman of the meeting; and William M. Phillips, head of the Department of Chemistry, General Motors Research Division, is in charge of the educational program.

The educational session, starting at 2 p.m. will include a paper on "Instrumentation" by William M. Phillips and F. L. Clifton, General Motors Research Division. Also, a representative of the U. S. Armed Forces will discuss the platers' part in the National Defense Program.

The dinner is scheduled for 7 p.m., and entertainment and dancing will conclude the meeting.

SOCIETIES

A feature of the recent **96TH MEETING** of **THE ELECTROCHEMICAL SOCIETY** was a special luncheon held by the Electrodeposition Division Saturday, October 15, in honor of Professor Frank C.

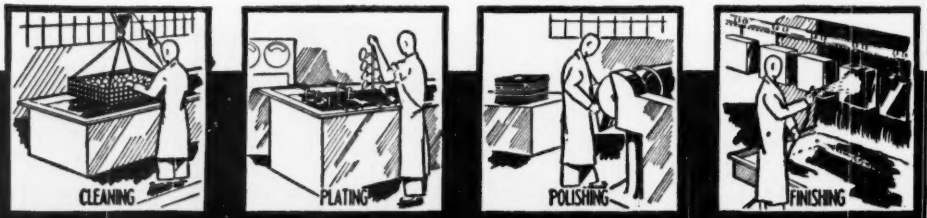
Fig. 2 — A close-up view of the speakers' table at the Electrodeposition Division luncheon, showing (left to right) Dr. Henry B. Linford, secretary of the Society; Dr. R. A. Schaefer, chairman, Electrodeposition Symposium; Dr. Frank C. Mathers, guest of honor; Dr. Allen G. Gray, editor-in-chief, "Modern Electroplating," and contributing editor, PRODUCTS FINISHING.

Mathers, Indiana University, one of the pioneers in the field of electroplating and a former president of the Society. At the luncheon Dr. Allen G. Gray, editor-in-chief of the second edition of the book "Modern Electroplating" being prepared by the Electrochemical Society, spoke briefly concerning the forthcoming edition and introduced his associates on the Editorial Advisory Board and the authors who have written the various chapters in the book.

Dr. Mathers, the principal speaker at the luncheon, reviewed the value of the Electrochemical Society and then discussed, from his wealth of experience in investigating various plating baths, certain examples of the effects of small quantities or traces of impurities in certain plating baths. In connection with his investigations, a number of unanswered questions have arisen, and Dr. Mathers mentioned a few of these and discussed several theories in connection with each. He concluded his talk with a word of advice to electrochemists, which can be summarized briefly in the phrase, "think and try."

Fig. 1—A general view of the luncheon group assembled in honor of Dr. Mathers, showing the speakers' table in the background

(Products Finishing staff photos)

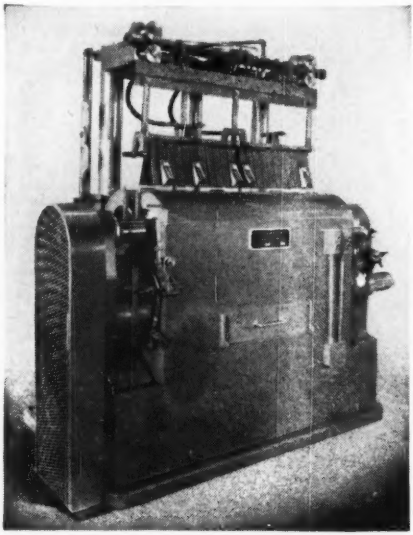


New • EQUIPMENT • MATERIALS • PROCESSES

Contour and Flat Polishing and Glazing Machine

Central Machine Works, 72 Commercial St., Worcester, Mass., has announced its Model 5, 18-inch stroke, hydraulic and semi-automatic glazing and polishing machine for contour and flat work, such as silverware, jewelry, hand tools, decorative hardware, flat irons, blanking stock, litho plates, and hub caps.

The unit is also available in Model MM with 36-inch stroke.



Model 5 Contour and Flat Polishing Machine

Codur Gloss White Baking Enamel KY-821

A new white baking enamel meeting most requirements has been developed by Maas & Waldstein Co., Newark 4, N. J., manufacturer of lacquers and synthetic enamels.

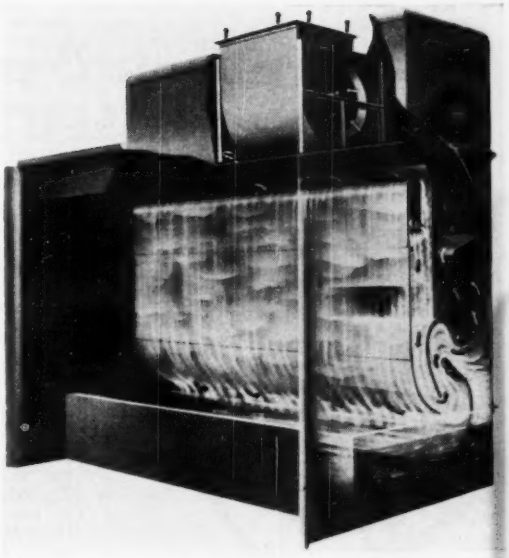
Especially formulated to meet the needs of manufacturers of fluorescent fixtures, metal venetian blinds, kitchen cabinets, hospital furniture, household appliances, and many other types of products finished with white baking enamels, this synthetic enamel known as Codur Gloss White Baking Enamel KY-821 is said to offer numerous advantages over ordinary white synthetic enamels.

Among its many features this new synthetic enamel combines unusually good mileage with excellent hiding properties, and exhibits unusually good shock resistance and improved flexibility, the manufacturer states.

Roto-Wash Spray Booth

A new paint spray booth designed to provide suction of paint-laden air at both the top and bottom of the water curtain has been announced by the Newcomb-Detroit Co., 5741 Russell, Detroit 11, Mich. The new booth, called the Roto-Wash

Roto-Wash Spray Booth



Spray Booth, also features pre-assembled construction and is said to require a minimum amount of maintenance.

Advantages claimed for the Roto-Wash Spray Booth include a more even flow of air across the face of the booth, resulting from the fact that paint-laden air is drawn both over and under the water curtain simultaneously; entrapment of the maximum amount of paint overspray in the spraying area; pre-wash of the air before it enters the washing section of the booth.

The entire washing action is created by suction from the exhaust fan. The air passing over the water curtain is pre-washed as it passes down the rear of the water curtain. Air passing under the water curtain is washed as it goes through the water cascading from the curtain into the tank. At this point the two streams of water and air join and are carried into the scrubbing Roto-Wash torrent. Metal baffles reverse the direction of the spray-charged air stream twice to ensure a thorough scrubbing action and maximum precipitation of paint particles in the water. The paint overspray thus removed settles as sludge in the tank below.

As the air leaves the Roto-Wash, its velocity decreases sharply to bring about separation of the air and water. Remaining droplets of water are then removed as the air passes the moisture separator before entering the exhaust fan clean and free of paint and water.

Wrinkle Vehicles

Manufacturers of industrial finishes will be able to produce uniform, high grade, and dependable Wrinkle finishes through the use of basic vehicles to be manufactured soon by New Wrinkle, Inc., 1171 Springfield St., Dayton 3, Ohio. No cooking will be necessary; the manufacturer will only need to add driers and pigments, then package the ready-to-use product.

Three types of two standard vehicles will be made, all of which will be adaptble to texture modification. The WV-101 S material is based on a short oil oleo-resinous varnish, which type has long been a standard in the industrial finish field because of its dependability in producing a Wrinkle of uniform design and texture.

Type WV-201 L is a similar vehicle with increased oil length to improve flexibility, when desired in the end product, with regard to pigmentation and baking schedules. This material will give a harder baking product in a somewhat shorter time than the WV-101 S formulation.

Type WV-301 A is an alkyd type which is recommended for formulations where alkyd resins are specified and where shorter baking conditions are required. WV-301 A is said to possess satisfactory miscibility with oils and varnishes.

Morse Vertical "Rock-A-Drum" Truck

Easily and safely positioning and moving heavy drum loads of paints, lacquers, chemicals, emulsions, and all types of liquids and semi-liquids into the most convenient places for side dispensing of contents into smaller containers can be accomplished with the Morse Vertical "Rock-A-Drum" Truck, manufactured by the Morse Manufacturing Co., Inc.,

Rock-A-Drum Truck being used to position drum for moving or use

124 Dickerson St., Syracuse 2, New York.

Raising the heaviest drum load 15 inches above the floor for dispensing contents from the side opening can be done easily in a few minutes by one man. Only three simple operations are required: lock, rock, and turn over. One chime of the drum is engaged with a safety catch on the nosepiece of the truck, and the other chime is then securely locked to the truck platform by means of a turn screw. The operator then simply rocks the drum and truck as one unit to reverse vertical position where it is ready to roll on 3-inch wheels to any location for dispensing the drum contents.

Where mass production spray or dip painting or lacquering is employed or where a supply of any liquid must be continually at hand, the Rock-A-Drum Truck is a means of having a constant, adequate supply of the liquid located on the production line at all times.

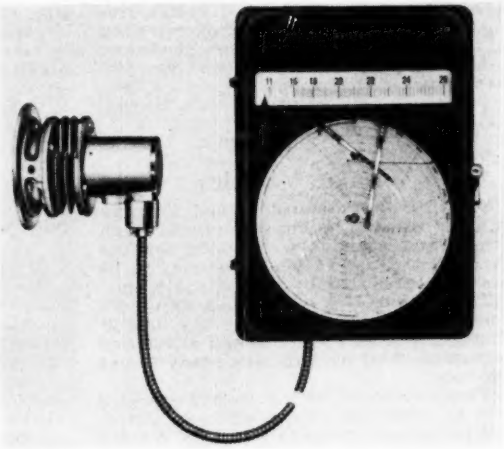
Bristol Pyrovisor

A radiation pyrometer known as the Pyrovisor, designed for indicating, recording, or controlling temperatures up to 4000 deg. F. in furnaces and kilns, has been developed by The Bristol Co., 108 Bristol Rd., Waterbury 91, Connecticut.

The Pyrovisor Radiation Unit, which is the temperature-sensitive head, is mounted on the outside of the furnace or kiln, away from the hot zone, and picks up radiant energy emitted from the surface of the object under measurement. In this way, actual surface temperature measurements of the work are obtained, rather than the usual furnace atmosphere temperatures. Extremely rapid response is claimed as the outstanding feature of the Pyrovisor Radiation Unit, which is said to produce a 99 per cent response to a temperature change within one second.

Chemical-Resisting General Maintenance Paint

A new general maintenance paint with chemical resistance that is said to be far greater than that of ordinary general maintenance paints has recently been placed on the market by the Organic Coatings Division of United Chromium.



Bristol Pyrovisor

Cut your Abrasive Costs with SILVER STREAK belts

AP Engineers licked this 3-way sanding problem — finishing stainless steel carving knives with cocobolo wood handles and brass rivets. Jewel Silver Streak cloth belts, grit No. 80, outperformed all other abrasives on this job.

Silver Streak belts, insulated to withstand terrific grinding heats, will speed up your surfacing jobs. If you have a sanding problem, write Abrasive Products, Inc., 555 Pearl St., South Braintree 85, Mass.

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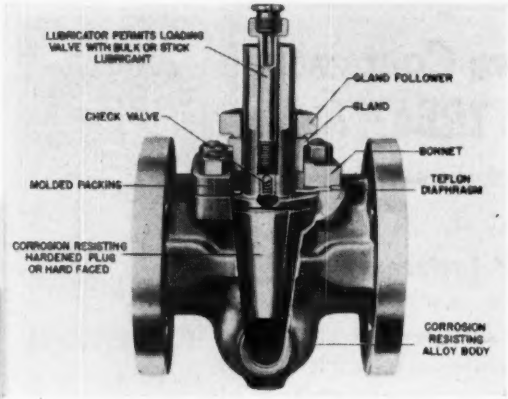
Incorporated. The new paint, which is known as Ucilon 1701, is based on chlorinated rubber.

The chemical resistance of Ucilon 1701 has been so designed to be of service where ordinary oils or oleoresinous paints are not or have not proved satisfactory. Ucilon 1701 is of real advantage in contact with acid and alkali fumes, moisture, vapors, grease, and oils. For this reason Ucilon 1701 is recommended as a coating for floors, walls, ceilings, exteriors of storage tanks, structural steel, and exteriors of certain process equipment and machinery in industrial atmospheres. Field reports on the coating indicate that its chemical resistance makes it exceptionally durable.

Ucilon 1701 is recommended for use on metals, wood, brick, and concrete. It can be applied over old paint or other surfaces without priming and without sandblasting or other expensive surface treatments. Loose rust and scale, however, should be removed. One or two coats are all that is required. Coverage is between 350 and 500 square feet per gallon, depending on the smoothness and porosity of the surface.

Complete information on Ucilon 1701, which is available in a full range of colors suitable for carrying out functional color



Top Lubricated Durco Type B Plug Valve

schemes, may be obtained from United Chromium, Incorporated, 51 East 42nd Street, New York 17, New York.

Stonhard Stoncote

Marketed by the Stonhard Co., 500 Stonhard Bldg., Dept. PF, 1306 Spring Garden St., Philadelphia 23, Pa., Stonhard Stoncote is a flexible protective coating for easy application to all maintenance areas or wherever corrosion is a special problem—on concrete floors, walls, ceilings, structural steel, tanks, pipes, vats, ducts, machinery, and equipment. It provides a tough, non-oxidizing, acid, alkali, oil, and water-resistant film.

Stoncote may be applied with either a brush or a spray and it is said to dry in from one-half to one hour under ordinary temperatures. It is available in five colors, as well as in black, white, transparent, and aluminum.

Corrosion Resisting Plug Valve

Developed by The Duriron Co., Inc., Dayton 1, Ohio, a new Type B Corrosion Resisting Plug Valve has been designed for heavy-duty corrosion service. Two new basic designs, plus a comprehensive range of corrosion resisting alloys, offer a complete plug valve service for nearly every type of operating and corrosive condition in the process industries.

All Durco Type B Plug Valves have the following features: (1) wide range of corrosion resisting alloy bodies; Durimet 20, Chlorimet 2, Chlorimet 3, Durco D-10, Pure Nickel, Inconel, Monel, and Ni-Resist; (2) hard, hardened, or hard-faced plugs with grooves cut after grinding and lapping; (3) Teflon diaphragm to provide a completely corrosion resisting self-lubricating seal; (4) provision for lubrication with bulk or stick lubricant; (5) proper plug taper, grinding and lapping for good continuous seating, long life, and positive mechanical operation in corrosive service.

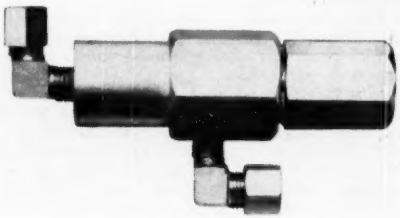
The Top Lubricated Durco Type B Valve has the lubricator in the plug shank. The plugs are hardened or hard-faced.

The Bottom Lubricated Durco Type B Valve (used where plugs are too hard to machine readily) is provided with a lubricator in the body, below the plug. The plug is flexible jointed, the plug proper being made of Duriron, Durichlor, or other hard corrosion resisting metal, while the plug shank is made of Durimet 20. The shank is permanently assembled into the hard alloy plug. This design prevents the transmission of shock from shank to plug and also provides the best material of construction for each part of the plug assembly.

Dri-R-Air Tank Drain

Known as the Dri-R-Air, a tank drain which automatically removes water that collects in the compressor tank has been developed by the Quincy Compressor Co., Quincy, Illinois.

Made of non-corrosive, rustproof brass



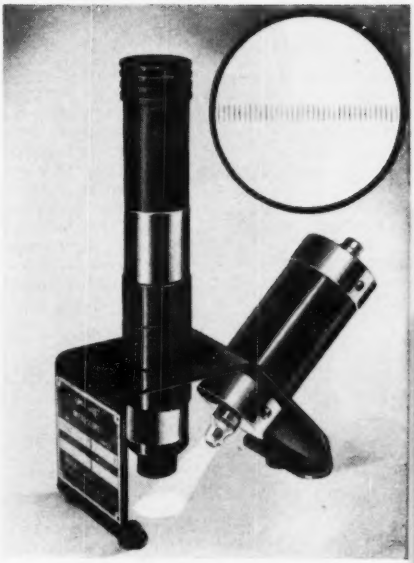
Dri-R-Air Tank Drain

with only one moving part and easily installed by using a few feet of ¼-inch O.D. copper tubing plus a standard "L", the Dri-R-Air Tank Drain is claimed to completely eliminate manual draining on all types of air compressors having bleed or pressure-type unloaders. In addition, it is said to reduce the possibility of frozen air lines and slugs of moisture that frequently ruin spray painting jobs and cause rust on materials being machined.

Model No. 232 Microscope

Designed for all types of general industrial work for use wherever a high quality medium power microscope is necessary, the Model 232 Microscope has been announced by the Clarkstan Corp., 11927 Pico Blvd., Los Angeles 34, California.

With a magnification of either 20X or 40X the Model No. 232 is said to have excellent resolving power and light efficiency. No external illumination is needed as the device has its own built-in light source. Standard cell and prefocused lights provide ample concentrated light over the entire field. For quantitative measurement and analysis of all types, a reticle has been incorporated for di-



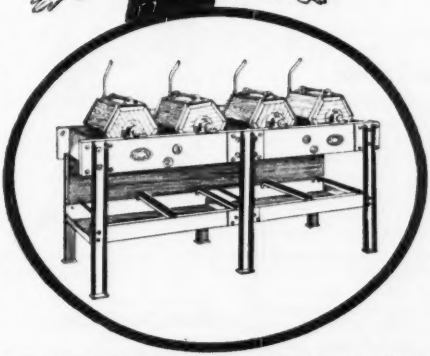
Model No. 232 Microscope

At your Service

COMPACT

Here's a new tumbling barrel unit, ruggedly constructed of well seasoned cypress with channel iron legs.

Cylinders may be made of maple, steel or neoprene lined steel. Unit is complete with drain pans and outlets in the bottom.



ECONOMY

The unit is chain driven by a single ratio motor, yet each cylinder may be operated individually by means of a friction clutch. Unit can be furnished with any number of cylinders.

Write for Further Information

DANIELS PLATING BARREL & SUPPLY CO.

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129 Oliver Street, Newark 5, N. J.

Telephone MArket 3-1762 or MArket 3-6196

Gunk "Hydro-Seal" Cleaning Kit

rect measurements with divisions of 0.004 and 0.002 inch for respective powers.

The eye point of the microscope is over 1 inch above the eyepiece, thus enabling the operator to work when wearing glasses and providing corrected vision for all examinations. Focusing by means of the friction sliding tube is said to be easy and positive.

All-Purpose Iridite

A new, all-purpose Iridite has been announced by Allied Research Products, Inc., Baltimore, Md. Named Iridite No. 8—HueBrite, this newest addition to the line of Iridite finishes is another step in the manufacturer's program of developing a wide range of Iridites for any corrosion or painting problem in finishing zinc, cadmium, copper, brass, bronze, and aluminum.

Iridite No. 8 is said to be extremely flexible from an application standpoint. Applied to plated, galvanized or die cast parts, it produces an iridescent yellow finish in its original reaction, which can be varied in color by changing the concentration of the operating solution and/or incorporating a bleaching step to obtain a clear, bluish, bright finish. The concentrate may be operated at water dilutions as high as 1 to 50, it is claimed.

The manufacturer states that the new finish offers a relatively high coverage per gallon, ease of control, and the ability to withstand any harmful effects of a hot rinse.

In performance, Iridite No. 8 provides good resistance to corrosion and excellent paint base characteristics.

Gunk "Hydro-Seal" Cleaning Kit

Gunk "Hydro-Seal," an aviation quality self-emulsifying and self-scouring carbon remover, available in large gasket cover-sealed 55-gallon high-utility kits, is now being offered by the Curran Ordnance Chemical Laboratory, South Canal St., Lawrence, Massachusetts.

Designed especially for large automobile and truck cylinder head cleaning, the kit is claimed to entirely eliminate hand scraping of carbon from automobile cylinder heads, removing insulating deposits and thus restoring the original thermal efficiency built into the cylinder head by the factory. Pistons, carburetors, water pumps, and all engine parts are also said to be brilliantly cleaned by the process.

Flex-a-Foam Filter Mask

The Goggle Parts Co., 1468 W. Ninth St., Cleveland 13, Ohio, has announced its Flex-a-Foam Filter Mask for protection against non-toxic nuisance dusts, which weighs only one ounce and consists of four interlocking parts.

Flex-a-Foam Filter Mask in position for use

The filter features a honeycomb construction of whipped foam latex ventilated by hundreds of tiny interconnecting cells that permit the passage of air but keep out non-toxic nuisance dusts as small as 1/25000 of an inch. Inner and outer frames are of Du Pont polythene plastic so flexible they adjust themselves to contours of any face yet indestructible in normal usage. Headbands are molded of natural rubber of a non-toxic, non-irritating quality.

"Hot 'N Cold" Glove

Manufacture of the "Hot 'N Cold" Glove for use where a liquid-tight glove with resistance to extremely high and low temperatures is required has been announced by The Pioneer Rubber Co., 1939 Tiffin Rd., Willard, Ohio.

"Hot 'N Cold" Glove

Of red Neoprene, the gloves have curved fingers and wrist-length gauntlets, with the insulating lining composed of several layers of wool fleece. Tests have proved them usable at temperatures as high as 314 deg. F. and as low as 85 deg. below zero. At 12 deg. F. no discomfort was found by the testers after an immersion period of 30 minutes.

Contractometer

The Brenner-Senderoff Contractometer, product of the Champion Manufacturing Co., 509 Fifth Ave., New York, N. Y., is a new process-control and research instrument for the electroplating and organic coating industries. It is said to provide precise determinations of tensile and compressive stresses in metallic coatings, paints, varnishes, lacquers, enamels, and various organic films.

Advantages claimed for the instrument in production control include; (1)) it permits routine checking of electroplating solutions by non-scientific personnel, thus helping to eliminate costly rejects and production-line interruptions; and (2) it aids in maintaining uniformity of product and in preventing premature deterioration of finish.

To use, the stainless steel spiral of the Contractometer is coated by plating, spraying or other means, under standard conditions of application. Stress set up by the coating causes flexing of the spiral. The strain is transmitted to the dial pointer, and the dial reading indicates the stress of the applied coating.

Since indications of abnormal stress can be obtained before visible imperfections occur, correct steps may be taken in

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470 Frelinghuysen Ave., Newark 5, N. J.

time to avoid rejects and production delays. Precise determinations of stresses in inch-pounds may readily be obtained with use of a one-pound calibrating weight supplied with the instrument.

Safety Rinsing Can

Recommended for industrial plants where inflammable liquids are used for

Safety Rinsing Can

cleaning parts, a device designated as the Safety Rinsing Can has been developed by Industrial Products Co., 2735 N. 4th St., Philadelphia 33, Pa. The can is manufactured from 16 gauge steel welded throughout and protected with a hot dip galvanized finish.

If during cleaning operations the contents of the rinsing can should catch fire, a fusible link in the can cover support bracket melts and the can cover closes, extinguishing the flame and preventing spread of the fire.

Chemclean No. 133 Di-Phase Cleaner

Chemclean No. 133 Di-Phase Cleaner, product of Chemclean Products Corp., 64 Sixth Ave., New York 13, N. Y., for removing buffing and drawing compounds, oils, greases, and so on, is said to be safe to work with, simple to use, and to eliminate all hand operations.

The bath is made up with three volumes of water and one volume of Di-Phase No. 133, which floats on the top. Objects can be in either phase, No. 133 or water. The parts are allowed to remain 2 to 5 minutes in the solution, removed, and without rinsing, put through either a mild alkali soak cleaner or directly into an electrocleaner. The result is claimed to be perfect cleaning.

The cleaner can be used in conjunction with a vapor degreaser advantageously if desired. It is said that work put through the solution without further processing will resist rust for some time.

PRODUCT LITERATURE

The publications listed in this section may be obtained free upon written request on company letterhead to the manufacturers concerned. Your courtesy in mentioning PRODUCTS FINISHING when requesting copies of these publications will be sincerely appreciated by the manufacturer and the publisher of this magazine.

Durco Bulletin 640. The Durco Type D high silicon iron top-lubricated plug valve is illustrated and described, together with a table of dimensions, in Bulletin 640, prepared by The Duriron Co., Inc., Dayton 1, Ohio.

E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa., has published a revised and enlarged six-page folder on **Houghto-Solv**, its fast-acting fuel oil additive which thoroughly dissolves sludge in the oil storage tanks and the entire system. In addition to describing the physical composition, functions, and results obtained with the product, the folder features many photographs, and also describes Houghto-Solv "W", an additive for emulsifying free water in the fuel oil system.

Engineered Equipment for Heat Treating, Pickling. A comprehensive brochure giving performance and cost-saving case histories of specially designed racks, shaker hearths, work boxes, pusher trays, carriers and other fabricated alloy fixtures is available from Brown-Hutchinson Iron Works, 1831 Clay St., Detroit 11, Michigan.

A 20 page bulletin No. 610 entitled **"Elgin Water Conditioning"** has been issued by Elgin Softener Corporation, Elgin, Illinois. This illustrated bulletin gives the water conditioning story—tells where it may be used profitably.

It contains complete up-to-date information on the design and application of water conditioning equipment covering zeolite water softeners, water treating chemicals, water conditioning systems for boilers and processing, water softener modernization, zeolites, water filters, taste and odor removers, and aerators. An improved water softener which delivers up to 44 per cent more soft water per regeneration and which eliminates the loss of zeolite mineral is described in detail.

Contractometer Leaflet. "The Brenner-Senderoff Contractometer for Measuring Stress in Electrodeposits" is described in a leaflet available from the Champion Manufacturing Co., 509 Fifth Ave., New York, N. Y. Functions of the device in process control are described.

Globe Burr-Rite Senior. A specifications sheet descriptive of the Globe Burr-Rite Senior, for mass production precision deburring, can be obtained from the Hupp Corp., Globe Stamping Div., 1250 W. 76th St., Cleveland 2, Ohio.

"A New All-Star Line-Up of Rust Preventives" is the title of an eight-page illustrated booklet which thoroughly describes and lists the many uses for each of the eleven "Rust Veto" products developed by E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa. A full page chart outlines the physical properties of each product and also lists such information as thickness and type of film, amount of coverage obtained in use, and other pertinent data.

RP Air Filter and Paint Arrestors, designed for use in connection with various types of spray paint installations, are described in a bulletin available from Research Products Corp., 1015 E. Washington Ave., Madison 10, Wis. Photographs and drawings in the bulletin show how the air filters should be installed in spray booths of various kinds and how the products function in removing paint particles from the air stream.

"Durco Corrosion-Resisting Alloys and Equipment" for the chemical process industries is the subject of General Catalog M, available from The Duriron Co., Inc., Dayton 1, Ohio. Containing 12 pages and illustrated throughout, the catalog provides descriptions, features, and use characteristics of the alloys and equipment.

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Catalogs

FOR YOUR LIBRARY

To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. Recording Thermometer
A bulletin available from The Bristol Co., Waterbury 81, Conn., describes the construction and operation of the Traveling-Recording Thermometer and points out uses for the instrument in production shops performing baking operations.

2. Synpex Enamels
M & W Technical Data Bulletin No. 106, distributed by the Maas & Waldstein Co., Newark 4, N. J., describes the physical properties of Synpex Enamels together with instructions for their application.

3. Black Finishes
A "Black Book" describing details of Zinc Black and other Black-Magic metal finishes has been published by the Mitchell-Bradford Chemical Co., Stratford, Bridgeport, Connecticut.

4. Polishing Wheels
Bulletin W-102 describing its complete line of polishing wheels and accessory products has been prepared by the Hanson-Van Winkle-Munning Co., Matawan, New Jersey.

5. Emulsion Cleaner
Mul Emulsion Cleaner is described in a folder issued by The DuBois Co., Cincinnati 3, Ohio, in which properties and suggested uses of the product are outlined.

6. Backstand Belts
"Facts About Backstand-Belt Grinding and Polishing" are enumerated in a booklet being distributed by Armour & Co., Chicago 9, Illinois.

7. Aluminum Finishes
A 64-page manual entitled "Finishes for Alcoa Aluminum" is available from the Aluminum Company of America, Pittsburgh 19, Pennsylvania.

8. Centrifugal Dryer
The New Holland Machine Co., New Holland, Pa., has published a bulletin providing complete specifications of the New Holland Kreider Centrifugal Dryer and describing typical installations.

9. Infra-Red Brochure
The Fostoria Pressed Steel Corp., Fostoria, Ohio, has published Brochure EV-1146 which illustrates and describes the use of the Fostoria Evenray System in industrial heating applications.

10. Industrial Wire Cloth and Screens
K-P Catalog No. 36, issued by Korb-Pettit Wire Fabrics and Iron Works, Inc., Philadelphia 22, Pa., describes by means of illustrations and data tables the many types of industrial wire cloth and woven wire screens manufactured by the company.

11. Gold Plating
An instruction booklet describing gold coloring solutions for various shades of gold is now being issued by Baker & Co., Inc., Newark, New Jersey.

12. Duranite H Folder
A folder outlining field results and laboratory tests made on its new organic finish, Duranite H, and extending over a two-year period is available from the Industrial Finishes Dept., Atlas Powder Co., Wilmington 99, Delaware.

13. General Purpose Fans
"General Purpose Fans" is the title of an eight-page bulletin designated as Bulletin 481 distributed by the New York Blower Co., Chicago 16, Illinois.

14. Flock Color Card
A color card containing samples of flock finishes has been issued by the Rayon Processing Company of Rhode Island, Inc., Central Falls, Rhode Island.

15. Metal Lacquers
"Is There A Better Metal Finish Than The One You Now Use?" is a booklet issued by The Egyptian Lacquer Mfg. Co., Newark, N. J., describing six clear lacquers for metal.

16. Chemifinishes
General information concerning the finishing of metals with Du-Lite materials is contained in literature prepared by The Du-Lite Chemical Corp., Middletown, Connecticut.

17. Electric Radiant Heaters

The Edwin L. Wiegand Co., Pittsburgh 8, Pa., has available Bulletin CS-603 which describes the construction of Chromalox heaters and lists the uses, operating characteristics, and advantages of the infra-red units.

18. Temperature Controls

Self-operated temperature controls for plating and finishing applications are described in Catalog No. 650 available from the Sarco Co., Inc., New York 1, New York.

19. Deburring and Finishing Equipment

"Cut Labor Costs ½ or More" is the title of a bulletin issued by Almco, Division of Queen Stove Works, Inc., Albert Lea, Minn., describing the complete line of Supersheen deburring and finishing barrels, equipment, and supplies.

20. Striplastic No. 320

A bulletin describing the properties and applications of Striplastic No. 320 is available from the Striplastic Co., Cleveland 6, Ohio.

21. Cleaning Emulsion

"Minit-Kote," a cleaning emulsion for preparing metal surfaces for painting, is fully described in a four-page two-color illustrated folder prepared by Klem Chemicals, Inc., Dearborn, Michigan.

22. Protective Coatings

"Ucilon" Specialized Industrial Coatings for the protection of metal, concrete, and wood are the subject of a four-page folder prepared by United Chromium, Inc., New York 17, New York.

23. Finishing Equipment

The Despatch Oven Co., Minneapolis 14, Minn., has prepared Bulletin C-51 which illustrates and describes its complete line of gas-oil, electric, and steam finishing equipment.

24. Zinc and Cadmium Dip

"Iridite," a quick dip process for improving corrosion resistance or as a paint base or final finish on all zinc or cadmium surfaces, is described in a four-page folder published by Allied Research Products, Inc., Baltimore 5, Maryland.

25. Demineralizers

Filt-R-Stil Demineralizers designed to deliver the low cost chemical equivalent of distilled water are illustrated and described in a booklet issued by the Ion Exchange Products Dept., American Cyanamid Co., New York 20, New York.

26. Plating Barrel

Facts concerning the construction and operation of the new King Hardwood Plating Barrel are presented in a folder available from King's Hardwood Plating Barrels, Dayton 3, Ohio.

27. Abrasive Grain

The Simonds Abrasive Co., Philadelphia 37, Pa., is issuing an illustrated data sheet on "Borolon" Aluminum Oxide Abrasive Grain for the polishing trade and general industrial uses.

28. Activated Carbon

The use of activated carbon for decolorizing, purifying, and deodorizing various liquids and electroplating solutions is described in literature available from the Darco Corp., New York 17, New York.

29. Spray Equipment

Catalog 86, illustrating and describing its line of low pressure spray guns, automatic spray guns, nozzles and tips, spray gun accessories, pressure tanks and control heads, portable painting units, stationary compressors, and Pneumix air-motored agitators, is available from the Eclipse Air Brush Co., Newark 7, New Jersey.

30. Boothcote Circular

A circular describing the use of Boothcote, a spray booth coating, is available from the Hygrade Food Products Corp., Boothcote Division, Buffalo 6, New York.

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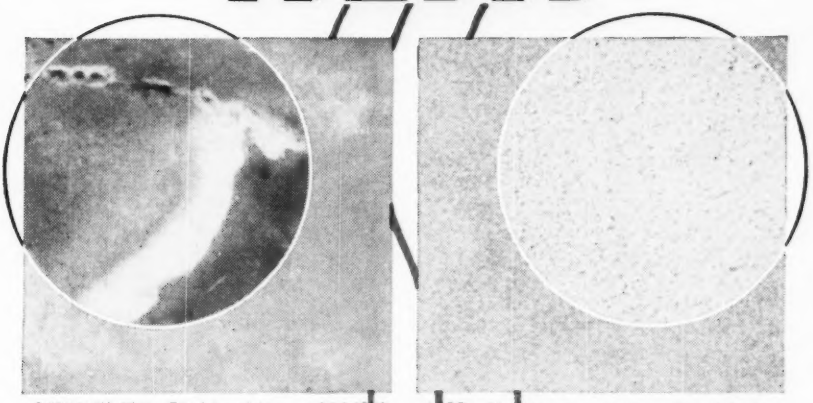
MICO SILICONE-BASE FINISH SOLVES YOUR FINISHING PROBLEM WHEREVER THERE IS

HEAT



ORDINARY FILM—Total breakdown at 1000°(F)

MICO—Film integrity unaffected after 1000 hrs.

In this dramatic test by a nationally known laboratory the steel plate at the left was coated with ordinary heat-resisting material, while the one at the right was coated with MICO Aluminum. Both were then subjected to 1000° heat. As the unretouched enlarged sections show, the ordinary film completely broke down after only one hour. But MICO held up without signs of deterioration and was still going strong *after 1000 hours!* What further proof of MICO'S amazing durability! MICO can protect YOUR product, too, *wherever there is heat!* Investigate MICO today!

Write for complete details.

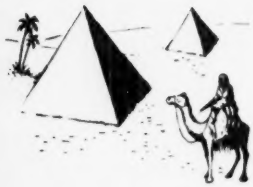
Mico

MIDLAND INDUSTRIAL FINISHES CO.

WAUKEGAN, ILLINOIS

ENAMELS • SYNTHETICS • LACQUERS • VARNISHES

WHAT DO *You* WANT in a DEGREASING SOLVENT?



UTMOST STABILITY and EASE of CONTROL?

Then you want PERM-A-CLOR—the *most highly stabilized* degreasing solvent. As to Control—simple titration *measures* service condition.

TOP ECONOMY?

For over-all degreasing economy and complete assurance even under most adverse conditions, *no other solvent equals PERM-A-CLOR.* For average use, TRIAD, the competitively priced stabilized trichlorethylene solvent, with Detrex service, will save you money.

HIGH SPEED?

PERM-A-CLOR and TRIAD are *unsurpassed in speed of degreasing.*

THOROUGH CLEANING?

It's PERM-A-CLOR and TRIAD again—for *perfect oil and grease removal* from all kinds of metal products.

SAFETY?

PERM-A-CLOR and TRIAD are *non-flammable, non-explosive* and truly safe for your equipment, products and personnel.

Write for complete information on these outstanding degreasing solvents and the advantages of Detrex free customer service.

DETREX *Corporation*

BOX 501, DETROIT 32, MICHIGAN